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Neogene Paleontology in the Northern

Dominican Republic 15.

The Genera *Columbella*, *Eurypyrene*,
Parametaria, *Conella*, *Nitidella*, and
Metulella (Gastropoda: Columbellidae)

by

Peter Jung

Paleontological Research Institution
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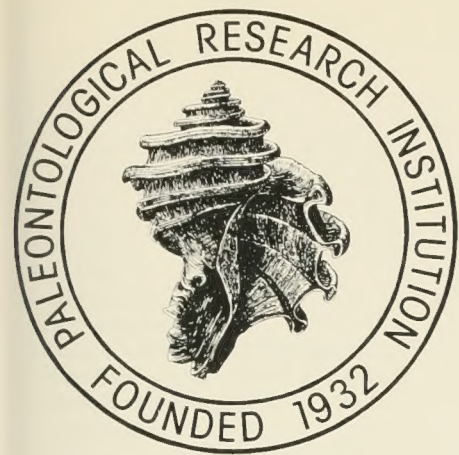
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NEOGENE PALEONTOLOGY IN THE NORTHERN DOMINICAN REPUBLIC
15. The Genera *Columbella*, *Eurypyrene*, *Parametaria*, *Conella*, *Nitidella*, and *Metulella*
(Gastropoda: Columbellidae)

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ABSTRACT

Thirteen species of columbellid gastropods belonging to six genera are described and figured. Two forms have been identified by means of "open nomenclature" thus leaving a total of 11 positively identified species. Three species, *Columbella lopezana* and *Parametaria* (*Dominitaria*) *lopezana*, both from the late early to early Middle Miocene Baitoa Formation of the López section on Río Yaque del Norte, and *Nitidella caimitana* from the Late Miocene Cercado Formation of the Río Cana section, and one subgenus, *Parametaria* (*Dominitaria*), are described as new.

Although the available material is not rich, the stratigraphic occurrences of these species are discussed. Only two species are well represented; three are moderately well represented, and the remaining species are represented by five or fewer specimens and thus must be considered rare.

RESUMEN

Se han descrito y representado trece especies de gasteropodos in la familia Columbellidae pertenecientes a seis generos. Dos formas han sido identificadas por medio de nomenclatura abierta, dejando así un total de once especies positivamente identificadas. Tres especies, *Columbella lopezana* y *Parametaria* (*Dominitaria*) *lopezana* del Mioceno temprano tardio a medio temprano, Formación Baitoa de la sección López in Río Yaque del Norte, *Nitidella caimitana* de finales de Mioceno, Formación Cercado de la seccion del Río Cana, y un subgenero, *Parametaria* (*Dominitaria*), han sido descritos como nuevos.

A pesar de no disponer de amplio material, la ocurencia estratigrafica de estas especies es discutida. Solo hay dos especies bien representadas; tres moderadamente representadas, y las especies restantes son representadas por cinco o menos especimenes y por lo tanto tienen que ser consideradas como raras.

INTRODUCTION

This paper is a further contribution to the series of taxonomic studies dealing with Neogene fossils from sections situated in the Cibao Valley of the northern Dominican Republic (Text-fig.1). The project and the framework within which these studies are being carried out have been outlined by Saunders *et al.* (1982) and Saunders *et al.* (1986). Jung (1986, p. 5) listed the most important early collections of molluscs from this area.

As is the case for all the contributions to this series, the material studied has been collected from measured sections. The geographic location of the investigated areas is shown in Text-figure 1. For detailed information as to geographic locations and stratigraphic position of all the collecting stations, as well as to the general biostratigraphic framework and the ages, the reader is referred to the paper by Saunders *et al.* (1986). Formational names have been used with care, because correlations from section to section are not certain.

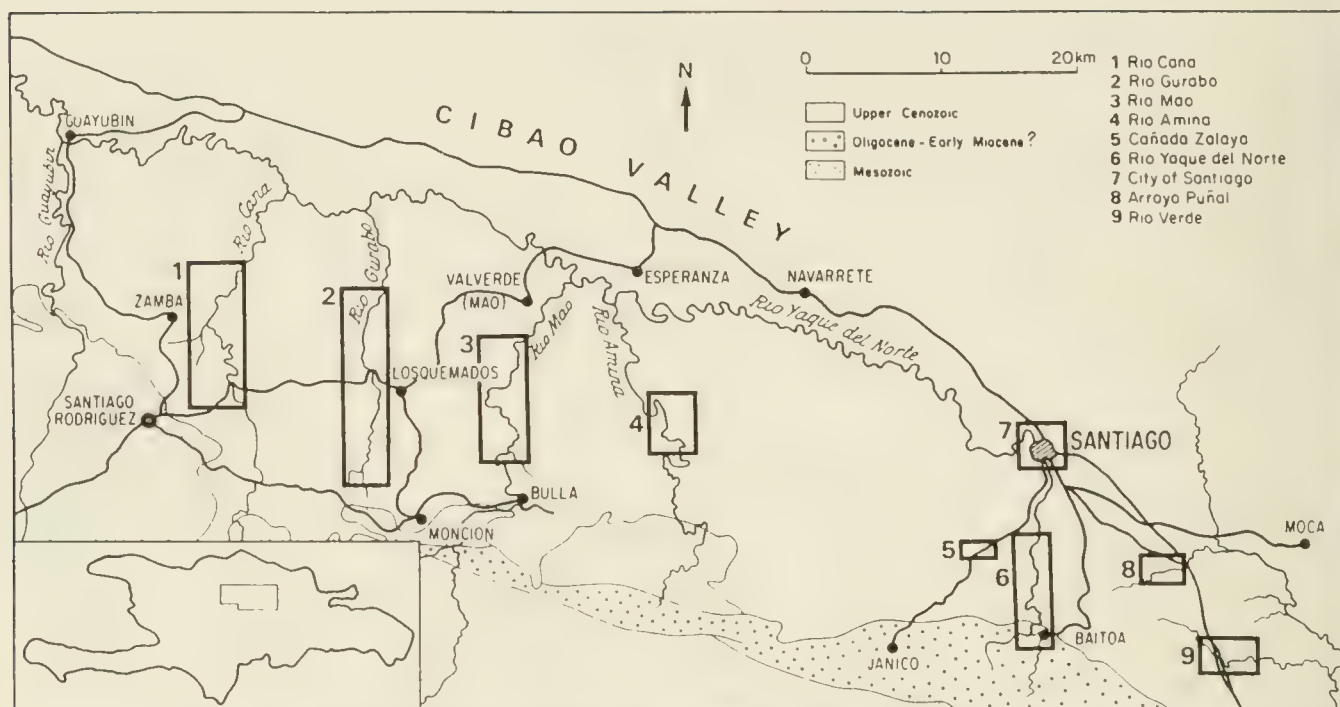
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The material on which this paper is based was collected during field work carried out in the years 1978,

1979, and 1980. The field work was made possible by a grant from the Swiss National Science Foundation (Grant 2.646-0.76). The financial help and the assistance in the field provided by Institut Francais du Petrole are gratefully acknowledged.

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In addition I am grateful to Mr. Wolfgang Suter, photographer (now retired) at the Naturhistorisches Museum Basel as well as to Dr. Richard Guggenheim and Mr. Marcel Duggelin, both of the Scanning Electron Microscope Laboratory, University of Basel, Switzerland.



Text-figure 1.—Index map showing location of investigated areas in the Cibao Valley, Dominican Republic (after Jung, 1986, text-fig. 1).

BIOSTRATIGRAPHY AND PALEOBIOGEOGRAPHY

A total of 13 columbellid species belonging to six genera is discussed in this paper. Two forms have been identified by means of open nomenclature (Richter, 1943, 1948; Matthews, 1973; Kornicker, 1979; Bengston, 1988) which leaves a total of 11 positively identified species.

The stratigraphic "ranges" of these species—or rather their stratigraphic occurrences—are plotted in Text-figures 2 to 9. As pointed out by Jung and Petit (1990, p. 88) the species are not continuously present through a given sequence of sediments, rather their occurrences are spotty. Several species occur only in one of the sections considered herein; others have been found in more than one section. The distribution of species in the various sections is as follows:

Río Gurabo section (Text-fig. 2):

Columbella submercatoria Olssen, 1922
Nitidella cibaoica (Maury, 1917a)
Metulella venusta (G. B. Sowerby II, 1850)

Río Cana section (Text-fig. 3):

Parametaria islahispaniolae (Maury, 1917a)
Nitidella cibaoica (Maury, 1917a)
Nitidella caimitana, n. sp.
Metulella venusta (G. B. Sowerby II, 1850)

López section of Río Yaque del Norte (Text-fig. 4):

Columbella lopezana, n. sp.

Eurypyrene inflata (Gabb, 1873b)

Parametaria lopezana, n. sp.

La Barranca on Río Yaque del Norte (Text-fig. 5):

Eurypyrene eurynotum (Woodring, 1928)
Metulella fusiformis Gabb, 1873a
Metulella venusta (G. B. Sowerby II, 1850)

Río Mao section (Text-figs. 6–8):

Parametaria islahispaniolae (Maury, 1917a)
Conella perplexabilis (Maury, 1917a)
Metulella venusta (G. B. Sowerby II, 1850)

Arroyo Zalaya section (Saunders *et al.*, 1986, text-fig. 36):

Metulella fusiformis Gabb, 1873a

Río Amina section (Text-fig. 9):

Metulella venusta (G. B. Sowerby II, 1850)

As found by Jung and Petit (1990, p. 88) for cancellariids, the distributional patterns of the columbellid species discussed herein reflect a considerable degree of stratigraphic restriction. Seven of the 11 positively identified species, *i.e.*, more than 60% of the discussed fauna, have been found in single sections only. This is a large percentage considering that the sediments of all the sections in which these species occur are of similar age (late Miocene to early Pliocene) with the exception of the López section which is of late early to early middle Miocene age (Saunders *et al.*, 1986, p. 30).

Of the seven species restricted to single sections,

three are known from only one locality within the Dominican Republic: *Eurypyrene inflata* (Gabb, 1873b) is recorded only from NMB locality 17290: Baitoa Formation (late early to early middle Miocene) of the López section on Río Yaque del Norte (Text-fig. 4); *Eurypyrene eurynotum* (Woodring, 1928) from TU locality 1404: Arroyo Babosico near La Barranca on Río Yaque del Norte (Text-fig. 5), upper part of *Globorotalia margaritae* zone (late early Pliocene); and *Nitidella caimitana*, n. sp. from TU locality 1230: Cercado Formation (late Miocene) of the Río Cana section (Text-fig. 3).

The remaining four species which are restricted to single sections are distributed as follows:

—*Columbella submercatoria* Olsson, 1922 has been found at two localities (NMB 15910, 15912) in the Río Gurabo section: upper part of Cercado Formation (late Miocene). See Text-figure 2.

—*Columbella lopezana*, n. sp. is recorded from four localities (NMB 16935, 17288, 17289, 17290) in the López section on Río Yaque del Norte: Baitoa Formation (late early to early middle Miocene).

—*Parametaria lopezana*, n. sp. is recorded from three localities (NMB 16936, TU 1363, TU 1364) in the López section on Río Yaque del Norte: Baitoa Formation (late early to early middle Miocene). See Text-figure 4.

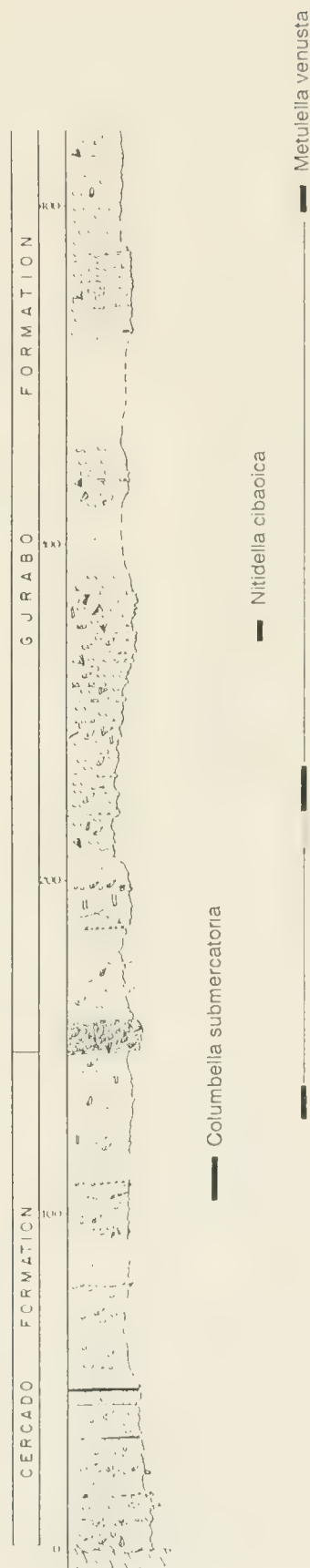
—*Conella perplexabilis* (Maury, 1917a) is known from a number of localities in the Río Mao section: Cercado Formation (late Miocene). See Text-figures 7 and 8.

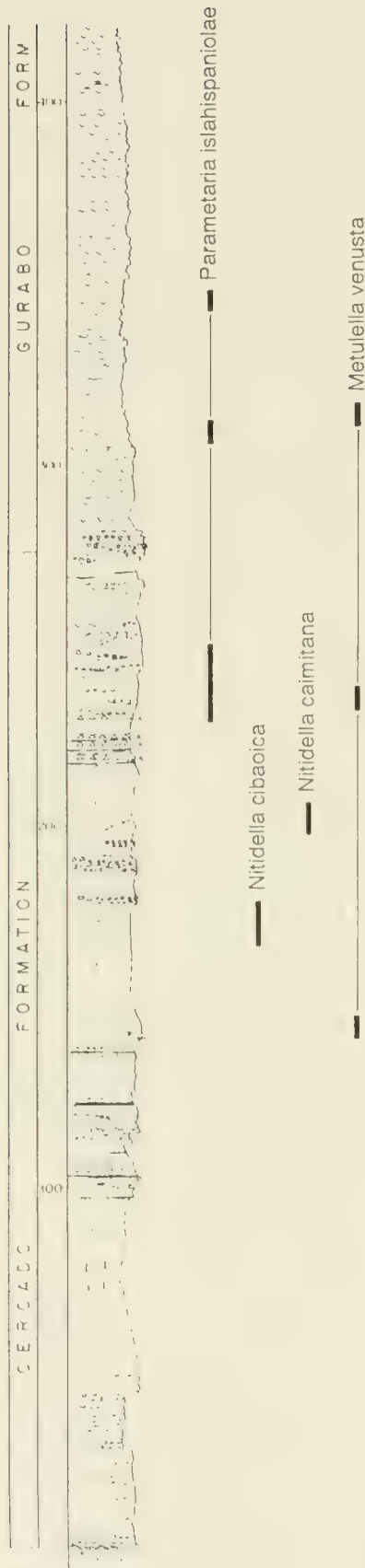
In addition to the seven species with restricted distribution as pointed out above, there are four species which occur in more than one section. The most widespread species is *Metulella venusta* (G. B. Sowerby II, 1850) which has been found in beds cropping out along Río Cana, Río Gurabo, Río Mao, Río Amina, and Río Yaque del Norte (Text-figs. 2, 3, 5, 9). It is followed by *Parametaria islahispaniolae* (Maury, 1917a) which is known from a number of localities in the sections of Río Cana and Río Mao (Text-figs. 3, 6, 7, 8).

Out of the 11 positively identified species eight are known only from the Dominican Republic. This fact points to a remarkable endemism. The remaining three species are also known from other countries. They are:

—*Columbella submercatoria* Olsson, 1922 is recorded from the late Miocene Cercado Formation of the Dominican Republic, but is also known from the early Pliocene Bowden Formation of Jamaica and from beds of late Miocene or early Pliocene age in Costa Rica.

Text-figure 2.—Columnar section of Río Gurabo showing (discontinuous) "ranges" of species discussed herein (after Saunders *et al.*, 1986, text-fig. 6). Numbers in second column from left refer to thickness in m.





—*Eurypyrene inflata* (Gabb, 1873b) is known from the Baitoa Formation (late early to early middle Miocene) of the Dominican Republic and from the early middle Miocene Brasso Formation of Trinidad.

—*Eurypyrene eurynotum* (Woodring, 1928) is reported from the late early Pliocene of La Barranca on Río Yaque del Norte, Dominican Republic, and from the early Pliocene Bowden Formation of Jamaica.

The species of the genus *Eurypyrene* have no living representatives at all; similarly the two species assigned herein to the new subgenus *Dominitaria* are both fossils, and so far there are no living species of that subgenus known. The remaining four genera dealt with in this paper (*Columbella*, *Conella*, *Nitidella*, and *Metulella*) all have living representatives in the Caribbean fauna. Thus none of the genera and subgenera discussed herein is a paciphile (Woodring, 1966).

ABBREVIATIONS OF REPOSITORY INSTITUTIONS

AMNH: American Museum of Natural History, New York, NY, U.S.A.

ANSP: Academy of Natural Sciences, Philadelphia, PA, U.S.A.

BMNH: British Museum (Natural History), London, England, U.K. (now The Natural History Museum)

NMB: Naturhistorisches Museum Basel, Switzerland (the letter H after NMB stands for gastropods).

PRI: Paleontological Research Institution, Ithaca, NY, U.S.A.

TU: Tulane University, New Orleans, LA, U.S.A.

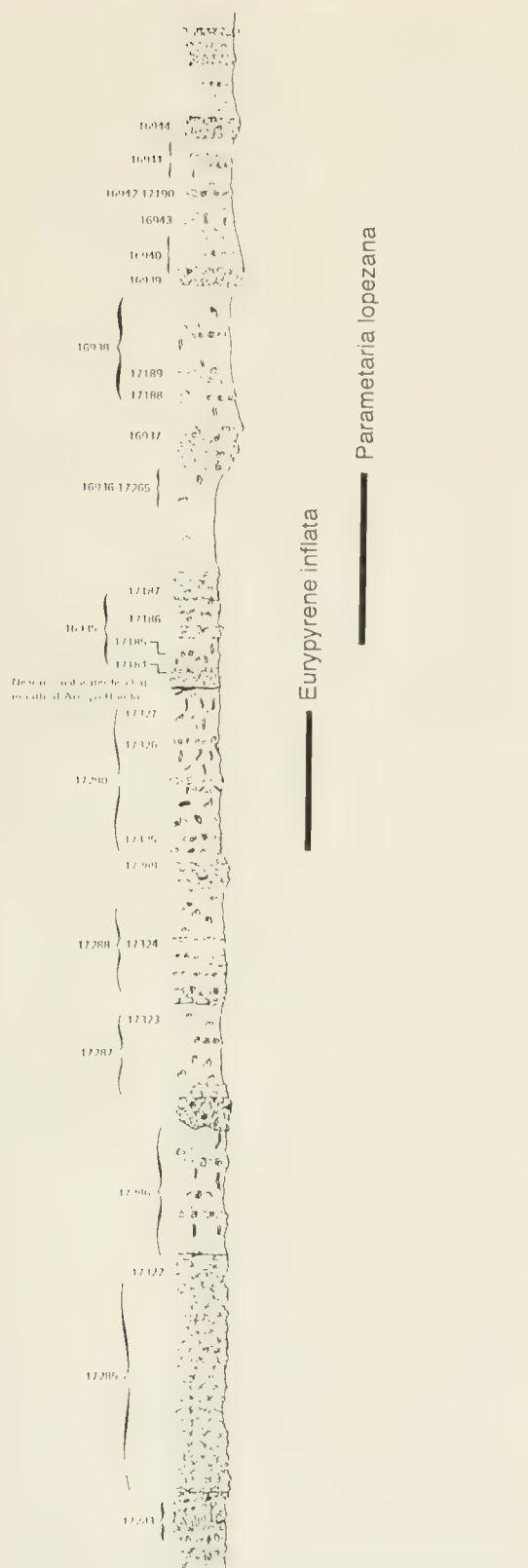
USNM: United States National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A.

SYSTEMATIC PALEONTOLOGY

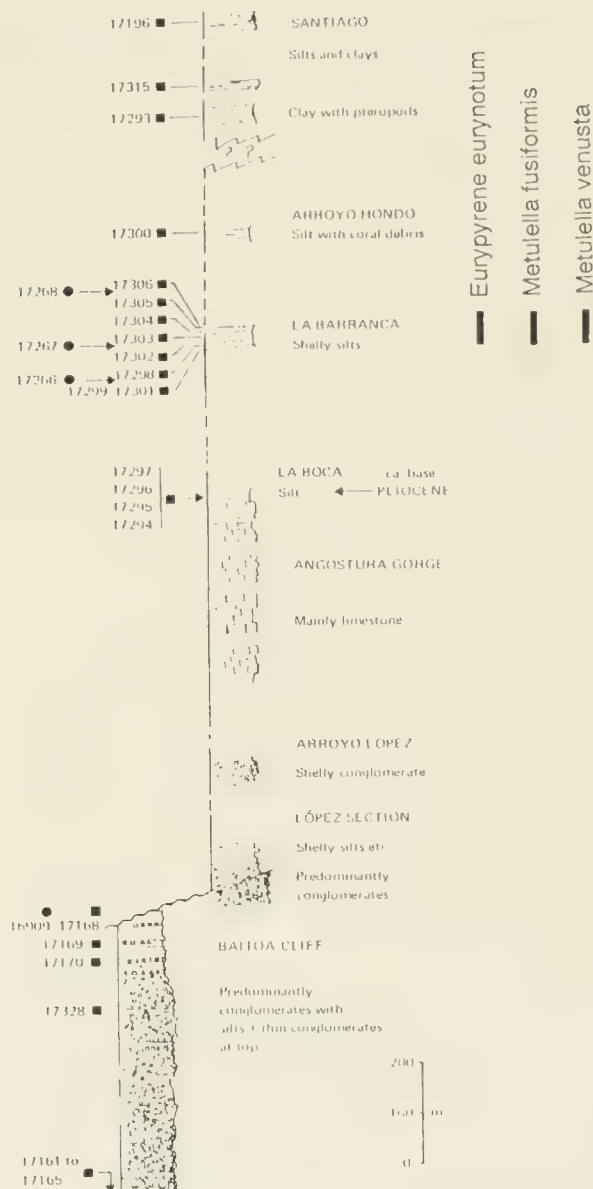
INTRODUCTION

As is usual in this series of papers on the paleontology of the northern Dominican Republic, the combined collections of the Naturhistorisches Museum Basel and Tulane University serve as a base for the present study. The new type and figured specimens of the material dealt with in this paper are deposited at the Naturhistorisches Museum Basel. A special effort has been

Text-figure 3.—Columnar section of Río Cana showing (discontinuous) "ranges" of species discussed herein (after Saunders *et al.*, 1986, text-fig. 16). Numbers in second column from left refer to thickness in m.



Text-figure 4.—Columnar section of cliff exposures on Río Yaque del Norte near López, north of Baitoa, showing “ranges” of species discussed herein and stratigraphic positions of NMB localities (after Saunders *et al.*, 1986, text-fig. 25).

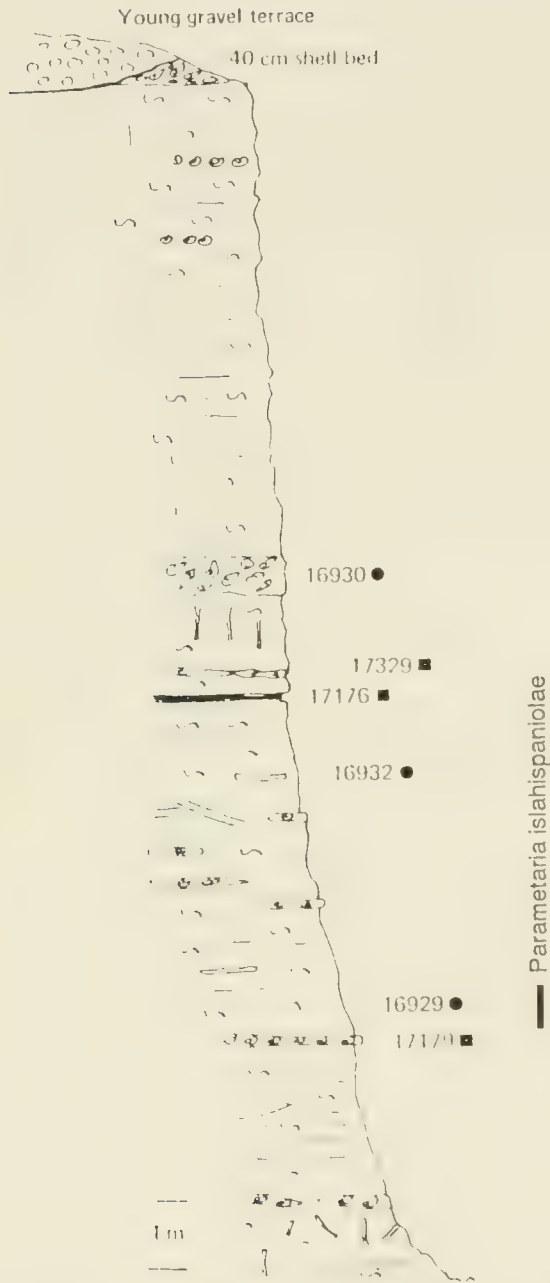


Text-figure 5.—Schematic column for Río Yaque del Norte showing “ranges” of species discussed herein and relative stratigraphic positions of NMB localities: black squares represent localities collected for microfossils and lithologic analyses; black circles represent localities collected for macrofossils (after Saunders *et al.*, 1986, text-fig. 24).

made to refigure old type specimens of the species discussed herein and specimens which are important for comparative purposes.

A short discussion of species concepts has been given by Jung (1986, p. 9; 1989, p. 37). Definitions of the headings used in the following systematic part may be found in Jung (1989, p. 35) and in Jung and Petit (1990, p. 93). They are not repeated here.

The 13 species of columbellid gastropods described

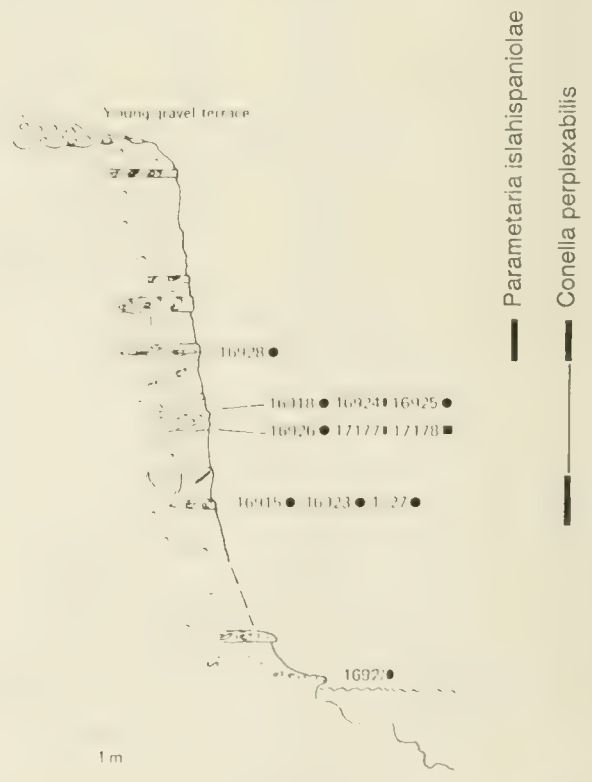


Text-figure 6.—Section exposed in Maury's Bluff 2 on Río Mao showing "range" of *Parametaria (Dominitaria) islahispaniolae* (Maury, 1917a) and stratigraphic positions of NMB localities: black squares represent localities collected for microfossils and lithologic analyses; black circles represent localities collected for macrofossils (after Saunders *et al.*, 1986, text-fig. 31).

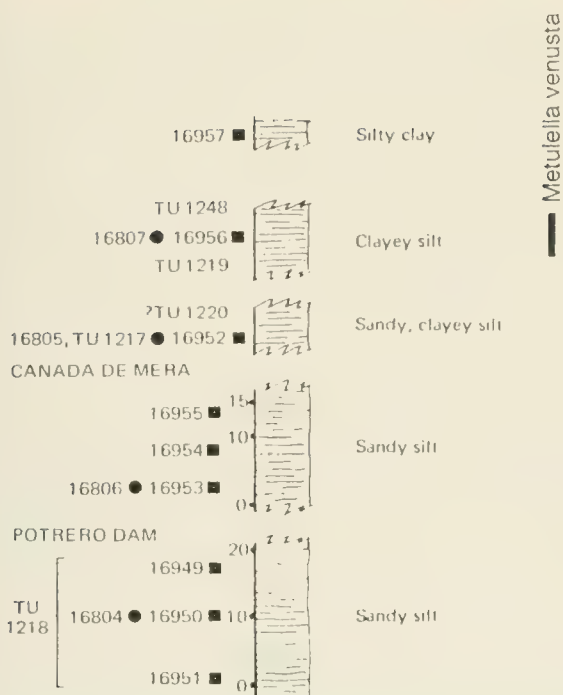
herein are assigned to six genera. The numbers of lots and specimens of each of these species are listed in Table 1. It is obvious from this table that the available material is not rich. Only two species are well represented (Table 1): *Parametaria (Dominitaria) islahispaniolae* (Maury, 1917a) and *Metulella venusta* (G. B. Sowerby II, 1850). Three species are moderately well



Text-figure 7.—Section exposed at the downstream (eastern) end of Maury's Bluff 3 on Río Mao showing "ranges" of species discussed herein and stratigraphic positions of NMB localities: black square represents locality collected for microfossils and lithologic analyses; black circles represent localities collected for macrofossils (after Saunders *et al.*, 1986, text-fig. 33).



Text-figure 8.—Section exposed at mouth of Arroyo Bajón on Río Mao showing (discontinuous) "ranges" of species discussed herein and stratigraphic positions of NMB localities: black squares represent localities collected for microfossils and lithologic analyses; black circles represent localities collected for macrofossils (after Saunders *et al.*, 1986, text-fig. 32).



Text-figure 9.—Schematic column for the central portion of Rio Amina showing "range" of *Metulella venusta* (G. B. Sowerby II, 1850) and relative stratigraphic positions of NMB and TU localities: black squares represent NMB localities collected for microfossils and lithologic analyses; black circles represent NMB localities collected for macrofossils (after Saunders *et al.*, 1986, text-fig. 35).

represented: *Conella perplexabilis* (Maury, 1917a), *Nitidella cibaoica* (Maury, 1917a), and *Metulella fusiformis* Gabb 1873a. The remaining eight species are represented by five or fewer specimens and thus must be considered rare.

Genus COLUMBELLA Lamarck, 1799

Columbella Lamarck, 1799, p. 70.

Type species (by monotypy).—*Voluta mercatoria* Linné, 1758, p. 730. Recent, West Indies.

Diagnosis.—Shell of small to medium size (10–30 mm in height), stout, and solid. Protoconch consists of about one and a half smooth volutions. Number of teleoconch whorls usually six to seven. Profile of spire whorls almost straight, slightly convex, or somewhat shouldered. Body whorl large, evenly rounded or shouldered. Sculpture consists of more or less accentuated spiral cords, or it is lacking entirely. Axial sculptural element subordinate or missing. Aperture sigmoid and narrow. Outer lip usually with prominent denticles on its inner surface. Columella with denticles. Anterior canal short, posterior canal inconspicuous.

Remarks.—A list of synonyms of the genus *Columbella* has been given by Radwin (1977a, p. 411). The generic name *Pyrene* Röding (1798, p. 134) has

Table 1.—Numbers of lots and specimens of each of the 13 species of columbellid gastropods available for this study.

taxon	number	
	number of lots	number of specimens
<i>Columbella submercatoria</i>	2	2
<i>Columbella</i> aff. <i>rusticoides</i>	1	5
<i>Columbella lopezana</i> , n. sp.	4	5
<i>Eurypyrene inflata</i>	1	1
<i>Eurypyrene eurynotum</i>	1	1
<i>Parametaria</i> (<i>Dominitaria</i>) <i>islahispaniolae</i>	12	89
<i>Parametaria</i> (<i>Dominitaria</i>) <i>lopezana</i>	3	5
<i>Conella perplexabilis</i>	5	26
<i>Nitidella cibaoica</i>	5	19
<i>Nitidella</i> aff. <i>cibaoica</i>	1	1
<i>Nitidella caimitana</i>	1	3
<i>Metulella fusiformis</i>	3	15
<i>Metulella venusta</i>	23	129
Total	62	301

been used frequently for species of this group, but both Keen (1971, p. 573) as well as Radwin (1977a, p. 412; 1978, p. 333) have shown that the name *Columbella* should be retained, because there are marked differences in radular dentition and the shape of early whorls.

The stratigraphic range of the genus is late Miocene to Recent.

Columbella submercatoria Olsson, 1922

Plate 1, figures 1–12

Columbella submercatoria Olsson, 1922, p. 125, pl. 10, figs. 33, 34. Woodring, 1928, p. 270, pl. 16, fig. 9.

Description.—Shell of small to medium size (12–25 mm in height), solid, and stout. Protoconch consists of one and a half smooth volutions. Number of teleoconch whorls six to seven. Profile of spire whorls varying from almost straight to somewhat shouldered. Body whorl large, evenly rounded to slightly shouldered. Sculpture consists of 22 to 25 spiral cords, which are sometimes wrinkled by growth lines. Number of spiral cords on last spire whorl varying from five to seven. Aperture sigmoid and narrow. Outer lip thickened, with prominent denticles on its inner surface. Basal part of inner lip with a few prominent denticles. Anterior canal short. Posterior canal inconspicuous, bordered by a small callus on the parietal wall.

Lectotype.—PRI 21069 (selected by Woodring, 1928, p. 271). See Plate 1, figures 1–3.

Dimensions of lectotype.—Height 17.5 mm; width 10.5 mm.

Type Locality.—Red Cliff Creek, Costa Rica. This place name cannot be found on old or modern maps. Although Olsson (1922) hardly ever gave accurate geographic information, Red Cliff Creek most probably is situated in the Limon Basin. The fossils from this area

Table 2.—Measurements of *Columbella submercatoria* Olsson, 1922. Figures are in mm.

	restored height	width
PRI 21069 (lectotype)	17.8	10.5
PRI 21070 (paralectotype)	16.1	10.0
USNM 369448: specimen figured by Woodring (1928, Pl. 16, fig. 9)	12.2	6.6
NMB H 17394 (Pl. 1, figs. 7–9)	20.0	11.3
NMB H 17395 (Pl. 1, figs. 10–12)	19.5	11.8

have been collected from beds formerly assigned to the "Gatun Stage"; they probably are of late Miocene or early Pliocene age.

Remarks.—The Dominican Neogene has yielded only two specimens of this species. Their protoconchs are only partly preserved. In one of the specimens the profile of the spire whorls is practically straight, in the other one slightly convex. In addition the central portion of the outer lip is not greatly thickened in one of the specimens.

Comparisons.—As noted by Olsson (1922, p. 125) and Woodring (1928, p. 271), *C. submercatoria* is closely related to the living Caribbean *C. mercatoria* (Linne) (1758, p. 730) (see Pl. 2, figs. 1–6), and appears to be the direct ancestor of the latter (Radwin, 1977a, p. 412). *C. mercatoria* has also been recorded from the Pleistocene of Panama (Brown and Pilsbry, 1913, p. 495). The main difference between the two species consists in the finer spiral sculpture of *C. submercatoria*. In *C. submercatoria* the number of spiral cords ranges from 22 to 25, whereas in *C. mercatoria* it is less than 20. Lectotype and paralectotype of *C. submercatoria* are refigured here (Pl. 1, figs. 1–6). I agree with the statement by Gibson-Smith and Gibson-Smith (1979, p. 26) that *C. williamgabbi* Weisbord (1962, p. 308, pl. 27, figs. 14, 15) is the same as *C. mercatoria*. *C. williamgabbi* is known from the Mare Formation of Cabo Blanco, Venezuela, which is of middle to late Pliocene age (Gibson-Smith and Gibson-Smith, 1979, p. 29; Bolli and Saunders, 1985, p. 160, fig. 4, p. 174, fig. 11). Specimens of *C. williamgabbi* from the Mare Formation are at hand for comparison. The holotype of *C. williamgabbi* is refigured here (Pl. 2, figs. 7–9).

C. platynema Woodring (1928, p. 271, pl. 16, fig. 10) from the early Pliocene Bowden Formation of Jamaica is known from the holotype only, which is refigured here (Pl. 3, figs. 1–3). It is smaller and more slender than *C. submercatoria*, and there are more prominent and less numerous spiral cords. The lower part of the inner lip of *C. platynema* carries more and heavier denticles than that of *C. submercatoria*.

C. rusticoides Heilprin (1887, p. 81, fig. 9) was originally described from the Caloosahatchee Formation

of Florida, the age of which is middle Pliocene according to Keroher and others (1966, p. 585), Plio-Pleistocene according to Carter (1984, table), but late Pliocene according to Lyons (1991, p. 146). *C. rusticoides* is still living in the Recent fauna (Olsson and Harbison, 1953, p. 230; Radwin, 1977a, p. 412). Recent specimens at hand from Key Biscayne, Florida, show that *C. rusticoides* is similar in degree of slenderness to *C. submercatoria* or *C. mercatoria*, but that its spiral sculpture is much less prominent or even lacking.

The description of the living *C. somersiana* Dall and Bartsch (1911, p. 278, pl. 35, fig. 2) was based on a large (height: 24 mm), immature specimen from Bermuda. *C. somersiana* falls within the variability of *C. mercatoria*, and I therefore agree with Radwin (1977a, p. 412), who considers it as a junior synonym of the latter.

Material.—Two lots with total of only two specimens as listed below:

1. 1 spec., NMB H 17394; NMB locality 15910: Río Gurabo; upper part of Cercado Formation (late Miocene).

2. 1 spec., NMB H 17395; NMB locality 15912: Río Gurabo; upper part of Cercado Formation (late Miocene).

Measurements.—See Table 2.

Occurrence.—*C. submercatoria* occurs in the Río Gurabo section only: NMB localities 15910 and 15912. Both fall within the upper part of the Cercado Formation (late Miocene) according to Saunders *et al.* (1986, text-figs. 4, 6).

Distribution.—Beds of late Miocene or early Pliocene age, Limón Basin, Costa Rica. Bowden Formation (early Pliocene), Bowden, Jamaica. Upper part of Cercado Formation (late Miocene), Dominican Republic.

Columbella aff. *rusticoides* Heilprin, 1887

Plate 3, figures 4–9

Description.—Shell of small size (11–15 mm in height), moderately slender. Protoconch not known. Number of teleoconch whorls five. Profile of the first two to three spire whorls straight, of later spire whorls convex. Body whorl moderately inflated. Spiral sculpture consists of numerous threads. In addition the first two to three teleoconch whorls carry inconspicuous, orthocline riblets. Number of spiral threads on last spire whorl varying from seven to eight. Aperture sigmoid and narrow. Outer lip thickened, especially so around the middle of its height; its inner surface with prominent denticles. Inner lip with a few somewhat irregular denticles near its base. Anterior canal short, hardly recurved. Posterior canal not prominent.

Remarks.—Only five specimens of this species are

at hand. Three of them are so badly worn that their spiral sculpture is hardly recognizable. The orthocline riblets on the early teleoconch whorls are visible only on one of the figured specimens (Pl. 3, figs. 7–9).

Comparisons.—As pointed out under *C. submercatoria*, *C. rusticoides* Heilprin (1887, p. 81, fig. 9) was originally described from the Caloosahatchee Formation of Florida, but is still living in the Recent fauna. *C. aff. rusticoides* is similar in degree of slenderness to *C. rusticoides*, but its later whorls are evenly convex and not shouldered. Its spiral sculpture is more prominent than that of *C. rusticoides*. Four recent specimens of *C. rusticoides* from Key Biscayne, Florida are at hand for comparison. Although all of them are somewhat worn, one specimen shows inconspicuous, orthocline riblets on the early teleoconch whorls and in the respect is similar to the figured specimens of *C. aff. rusticoides* (Pl. 3, figs. 7–9). *C. aff. rusticoides* is somewhat smaller than *C. platynema* Woodring (1928, p. 271, pl. 16, fig. 10) from the early Pliocene Bowden Formation of Jamaica. The description of *C. platynema* was based on the holotype only, a specimen with strongly worn spire whorls. It is refigured here (Pl. 3, figs. 1–3). It is therefore not known whether *C. platynema* has any axial sculpture on the early spire whorls as does *C. aff. rusticoides*. The worn spire whorls of *C. platynema* give the (probably wrong) impression that its spire is lower than that of *C. aff. rusticoides*. The Dominican species mainly differs from *C. platynema* by its considerably finer and less prominent spiral sculpture.

Material.—One lot containing five specimens as listed below:

1. 5 spec., TU locality 1230: Río Cana, east bank, just above the ford at Caimito on Los Quemados-Sabaneta road (= USGS 8534; Maury's Zone H). Upper part of Cercado Formation (late Miocene).

Measurements.—See Table 3.

Occurrence.—Known only from TU locality 1230: Río Cana at Caimito; upper part of Cercado Formation (late Miocene) (Saunders *et al.*, 1986, text-figs. 15, 16).

Distribution.—Not known from outside the Dominican Republic.

***Columbella lopezana*, new species**

Plate 3, figures 10–15

Description.—Shell of small size (10–15 mm in height), stout. Protoconch consists of about two and a quarter smooth volutions. Number of teleoconch whorls up to five. Profile of the first teleoconch whorls straight, of later whorls slightly convex. Body whorl moderately inflated. Surface of whorls smooth. The inconspicuous growth lines are orthocline to slightly prosocline. Aperture sigmoid and narrow. Outer lip

Table 3.—Measurements for *Columbella aff. rusticoides* Heilprin, 1887. Figures are in mm.

	restored height	width
NMB H 17397 (Pl. 3, figs. 4–6)	15.1	8.4
NMB H 17398 (Pl. 3, figs. 7–9)	13.5	7.8
NMB H 17399/1	14.2	8.8
NMB H 17399/2	13.3	7.8
NMB H 17399/3	11.6	7.4

thickened, especially so around the middle of its height; its inner surface with numerous prominent denticles. Inner lip with a few denticles near its base. Anterior canal short, not recurved. Posterior canal inconspicuous.

Holotype.—NMB H 17400. See Plate 3, figures 10–12.

Dimensions of holotype.—Height 14.9 mm; width 9.3 mm.

Type locality.—NMB locality 16935: López section on Río Yaque del Norte; Baitoa Formation (late early to early middle Miocene) (Saunders *et al.*, 1986, text-figs. 21, 25).

Derivation of name.—Named after the López section, the type locality.

Remarks.—*C. lopezana* is represented by five specimens only. All of them are somewhat worn, so that the growth lines are sometimes hardly recognizable. The protoconchs of four of the five available specimens are strongly worn and not completely preserved. Thus the number of volutions indicated above is not quite certain. The protoconch of the fifth specimen is not preserved.

Comparisons.—No comparable species has been found in the Tertiary Caribbean faunal province. There are, however, a few smooth species living in the Eastern Pacific (Keen, 1971, pp. 573, 574, figs. 1153, 1159–1161). But these species are clearly distinct from *C. lopezana*.

Material.—Four lots with a total of only five specimens as listed below (all the specimens have been collected from the López section on Río Yaque del Norte; Baitoa Formation: late early to early middle Miocene):

1. 2 spec., NMB H 17400 (Pl. 3, figs. 10–12) and NMB H 17402; both from NMB locality 16935.

2. 1 spec., NMB H 17401 (Pl. 3, figs. 13–15); NMB locality 17288.

3. 1 spec., NMB H 17403; NMB locality 17289.

4. 1 spec., NMB H 17404; NMB locality 17290.

Measurements.—See Table 4.

Occurrence.—Known only from the López section on Río Yaque del Norte: NMB localities 16935, 17288,

17289, 17290; Baitoa Formation (late early to early middle Miocene) (Saunders *et al.*, 1986, p. 30, text-figs. 21, 25).

Distribution.—Not known from outside the Dominican Republic.

Genus EURYPYRENE Woodring, 1928

Eurypyrene Woodring, 1928, p. 272.

Type species (by original designation).—*Pyrene (Eurypyrene) eurynotum* Woodring, 1928. Bowden, Jamaica; Bowden Formation (early Pliocene).

Diagnosis.—Shell of medium size (14–26 mm in height), stout, and solid. Protoconch consists of about one and a half smooth volutions. Shape of its outer lip not known. Number of teleoconch whorls five to six. Profile of early spire whorls straight to slightly convex. Later spire whorls and body whorl somewhat shouldered. Spiral sculpture consists of threads on the lower part of the body whorl. Axial sculptural element subordinate. Growth lines may be somewhat accentuated on shoulder of body whorl or even on last spire whorl. Outer lip moderately thickened, with a shallow sinus near its adapical end; its inner surface with long denticles. Anterior canal moderately long, only slightly recurved. Posterior canal more or less prominent.

Remarks.—The information concerning the protoconch in the above diagnosis is taken from Woodring (1928, p. 272), because the protoconch is not preserved in any of the available specimens. *Eurypyrene* has been described as a subgenus of *Pyrene*. *Pyrene*, however, is limited to the Indo-Pacific region according to Radwin (1978, p. 333) and its early spire whorls are terraced, which is not the case in *Eurypyrene*.

As pointed out by Woodring (1928, p. 272) there are no living representatives of the genus. Without citing a species Radwin (1978, p. 333) wrote that the genus is "last encountered in the Pleistocene of Florida". According to Radwin (1977a, p. 405, fig. 21) *Eurypyrene* first appeared in the late Miocene. As shown under *E. inflata*, however, the genus is already recorded from late early to early middle Miocene times.

Eurypyrene inflata (Gabb, 1873b)

Plate 4, figures 1–9

Strombina inflata Gabb, 1873b, p. 221.

Columbella inflata (Gabb), Pilsbry, 1922, p. 350 pl. 18, fig. 14.

Columbella inflata var. *brassica* Maury, 1925, p. 211, pl. 36, fig. 8.

Description.—Shell of medium size (22–26 mm in height), stout, and solid. Protoconch not known. Number of teleoconch whorls up to six. Profile of early spire whorls straight to slightly convex. Later spire whorls

and body whorl shouldered. Spiral sculpture consists of threads on the lower part of the body whorl. Axial sculpture missing except for growth lines, which may be somewhat accentuated on the shoulder of the body whorl. Outer lip moderately thickened, with long lirations on its inner surface. The outer lip has a shallow sinus near its adapical end. Posterior canal wide and prominent with a few short denticles on the callus of the parietal wall. Inner lip with denticles. Anterior canal moderately long, hardly recurved.

Holotype of E. inflata.—ANSP 3287. Plate 4, figures 1–3.

Dimensions of holotype of E. inflata.—Height 25.9 mm; width 13.8 mm.

Type locality of E. inflata.—Santo Domingo (= Dominican Republic); this is the only information given by Gabb (1873b) and Pilsbry (1922). The type locality is here restricted to NMB locality 17290; Río Yaque del Norte. This locality is situated in the López section, which is part of the Baitoa Formation (Saunders *et al.*, 1986, p. 30, text-figs. 21, 25), of late early to early middle Miocene age.

Holotype of E. inflata brassica.—PRI 1059. Plate 4, figures 7–9.

Dimensions of holotype of E. inflata brassica.—Height 16.6 mm; width 8.9 mm.

Type locality of E. inflata brassica.—Brasso District, Central Range, Trinidad. The exact locality of the holotype is not known. Brasso Formation. The Brasso Formation includes the foraminiferal zones of *Globorotalia fohsi* and its subspecies, which are of early Miocene age according to Bolli and Saunders (1985, p. 159, fig. 3).

Remarks.—Except for the holotype of *E. inflata* the Neogene of the Dominican Republic has yielded only one additional specimen of this species. Even Maury's expedition failed to find a specimen in the Dominican Republic (Maury, 1917a, 1917b, 1925, p. 211).

E. inflata brassica was also based on the holotype only. It is refigured here (Pl. 4, figs. 7–9) and is thought to be a somewhat immature specimen. The collections of the Naturhistorisches Museum Basel contain three specimens of *E. inflata brassica*, all from the early middle Miocene upper Brasso Formation of the Central Range, Trinidad. One of them from NMB locality 10301 (Caparo River) is somewhat immature and has dimensions similar to those of the holotype of *E. inflata brassica* (height 16.3 mm; width 9.1 mm). A second specimen from NMB locality 10365 (Guaracara River) is of similar size but lacks its body whorl. The third specimen is also from NMB locality 10365. It consists of the body whorl and the last spire whorl. Its width measures 13.2 mm, a dimension comparable to

Table 4.—Measurements of *Columbella lopezana*, new species. Figures are in mm.

	restored height	width
NMB H 17400 (Pl. 3, figs. 10–12) (holotype)	15.0	9.3
NMB H 17401 (Pl. 3, figs. 13–15) (paratype)	14.3	8.5
NMB H 17402; NMB locality 16935	12.7	8.1
NMB H 17403; NMB locality 17289 (paratypes)	10.4	7.1
NMB H 17404; NMB locality 17290	13.4	8.5

that of the specimens from the Dominican Republic. For this reason *E. inflata brassica* is taken in the synonymy of *E. inflata*.

Comparisons.—*E. eurynotum* (Woodring) (1928, p. 272, pl. 16, figs. 11, 12), the type species of the genus from the early Pliocene Bowden Formation of Jamaica, is considerably smaller than *E. inflata*; it is more slender, i.e., its body whorl is less bulging.

E. venezuelana (Weisbord) (1962, p. 332, pl. 29, figs. 19, 20) was based on a single specimen, the holotype, which is refigured here (Pl. 5, figs. 1–3). It had been collected from the Mare Formation of the Cabo Blanco area, Venezuela, the age of which is middle to late Pliocene (age assignment discussed by Jung, 1989, p. 20). Eleven specimens from the type locality of the Mare Formation are at hand (Gibson-Smith collection). They are somewhat smaller than *E. inflata*, and due to their larger apical angle they have a stouter appearance.

E. occidentalis (Weisbord) (1962, p. 334, pl. 29, figs. 21, 22), also from the middle to late Pliocene Mare Formation of Venezuela, was based on the holotype only, which is refigured here (Pl. 5, figs. 4–6). The holotype is not quite adult, having a thin (and broken) outer lip without lirations on its inner surface and no columellar callus developed. This very feature was used by Weisbord as a base for his comparative remarks. It is possible that *E. occidentalis* represents immature *E. venezuelana*.

Material.—One lot consisting of a single specimen as listed below:

1. 1 spec., NMB H 17405; NMB locality 17290: López section on Río Yaque del Norte; Baitoa Formation (late early to early middle Miocene).

Measurements.—See Table 5.

Occurrence.—In the Dominican Republic this species is known only from NMB locality 17290: López section on Río Yaque del Norte; Baitoa Formation, of late early to early middle Miocene age (see Saunders *et al.*, 1986, p. 30, text-figs. 21, 25).

Distribution.—Brasso Formation (early middle Miocene) of the Central Range, Trinidad. Baitoa Forma-

Table 5.—Measurements of *Eurypyrene inflata* (Gabb, 1873b). Figures are in mm.

	restored height	width
ANSP 3287; holotype (Pl. 4, figs. 1–3)	26.0	13.8
NMB H 17405 (Pl. 4, figs. 4–6)	22.5	12.3

tion (late early to early middle Miocene), northern Dominican Republic.

***Eurypyrene eurynotum* (Woodring, 1928)**

Plate 5, figures 7–12

Pyrene (*Eurypyrene*) *eurynotum* Woodring, 1928, p. 272, pl. 16, figs. 11, 12.

Description.—Shell of small to medium size (14–17 mm in height), solid. Protoconch consists of one and a half volutions. Teleoconch whorls six. Profile of spire whorls practically straight. Late spire whorls and body whorl shouldered. Body whorl and late spire whorls sculptured by weak spiral threads. In the zone of the greatest inflation of the body whorl these spiral threads are obsolete. The shoulder of the body whorl and late spire whorls is accentuated by a more prominent spiral thread. Except for growth lines there is no axial sculpture. Outer lip moderately thickened, with long lirations on its inner surface. Posterior canal moderately prominent, with a few inconspicuous denticles on the callus of the parietal wall. Inner lip with denticles. Anterior canal moderately long, only slightly recurved.

Holotype.—USNM 135512. See Plate 5, figures 7–9.

Dimensions of holotype.—Height 14.0 mm; width 7.8 mm.

Type locality.—Bowden, Jamaica. Bowden Formation (early Pliocene).

Remarks.—*E. eurynotum* was based on the holotype and a single paratype, and the Dominican Neogene has yielded only one specimen, which is somewhat worn. It is larger than the Jamaican specimens, and its body whorl is slightly more inflated. Its protoconch is not preserved and its description given above is taken from Woodring (1928, p. 272).

Comparisons.—For comparison with *E. inflata* see under that species.

Material.—One lot consisting of a single specimen as listed below:

1. 1 spec., NMB H 17406. TU locality 1404: Arroyo Babosico, which enters Río Yaque del Norte from the West at La Barranca, approximately 8 km upstream from Santiago de los Caballeros, north side at second bluff below bridge on Las Charcas-La Barranca road; upper part of *Globorotalia margaritae* zone (late early Pliocene) according to Saunders *et al.* (1986, p. 30).

Table 6.—Measurements of *Eurypyrene eurynotum* (Woodring, 1928). Figures are in mm.

	restored height	width
USNM 135512: holotype (Pl. 5, figs. 7–9)	14.0	7.8
USNM 369450: paratype	15.7	8.1
NMB H 17406 (Pl. 5, figs. 10–12)	17.4	9.6

Measurements.—See Table 6.

Occurrence.—In the Dominican Republic this species is known only from TU locality 1404: Arroyo Babosico (for more details see above); upper part of *Globorotalia margaritae* zone (late early Pliocene) (Saunders *et al.*, 1986, p. 30).

Distribution.—Bowden Formation (early Pliocene) of Bowden, Jamaica. Beds of late early Pliocene age, northern Dominican Republic.

Genus **PARAMETARIA** Dall, 1916

Parametaria Dall, 1916, p. 25. Substitute name for *Meta* Reeve (1858–1859, pl. 32, under remarks for *Columbella picata*, 1859).

Type species of Meta Reeve (by subsequent designation, Reeve, 1859, pl. 1, under remarks for *Meta ovuloides*).—*Conus dupontii* Kiener, 1834–1880 (1846, pl. 61; 1849, p. 273) (for dates see Sherborn and Woodward, 1901, p. 218). Recent, Gulf of California to Tres Marias Islands, western Mexico.

Diagnosis.—Shell of small to medium size (11–28 mm in height), stout to moderately slender, coniform. Protoconch consists of one to two volutions. Teleoconch whorls usually six to seven and one half. Profile of spire whorls ranging from slightly concave to straight to shouldered. Spire whorls smooth (except for growth lines) or shouldered. Spiral sculpture on body whorl usually restricted to its abapical part. Aperture straight to slightly sigmoid. Outer lip somewhat extended adapically, its inner surface smooth or with denticles. Outer lip moderately thickened, but with a thin edge. Columellar callus inconspicuous, but usually absent. Posterior canal inconspicuous to moderately prominent. Anterior canal straight.

Remarks.—The genus *Parametaria* has never been studied in detail. Certain generic characteristics are contradictory depending on the author. Thus the inner surface of the outer lip is smooth according to Keen (1971, p. 598), has weak denticles (Coomans, 1967, p. 76), or carries denticles or lirations (Grant and Gale, 1931, p. 680). Discussing the variability of *P. dupontii* (Kiener), the type species of the genus, Jung (1969, p. 500) pointed out that the denticles on the inner surface of the outer lip may be strongly developed, weak, or absent. Stressing the relative importance of certain diagnostic features of other columbellid genera, Jung

(1989, p. 43) stated that “it is not very diagnostic, whether the inner surface of the outer lip is smooth or sculptured by denticles or lirae”.

Parametaria is a paciphile genus (Woodring, 1966, p. 428). In the western Atlantic part of the Tertiary Caribbean Faunal Province it is represented by the following two species: *P. prototypus* (Guppy) (1867, p. 171) and its synonym *P. schideri* (Rutsch) (1942, p. 148, pl. 5, figs. 5a, 5b) from the Savaneta Glauconitic Sandstone Member and the Melajo Clay Member, both of the Springvale Formation of Trinidad, now assigned to the early Pliocene; the second species is *P. rutschi* Jung (1969, p. 500, pl. 52, figs. 3–6) from the Matura shell bed of the Talparo Formation of Matura, Trinidad, which is now thought to be of Pleistocene age.

The subgenus *Parametaria* (see below) is therefore short-lived and restricted in geographic distribution being known only from the early Pliocene and the Pleistocene of Trinidad. In the Recent fauna of the Panamic Province it is represented by *P. dupontii*.

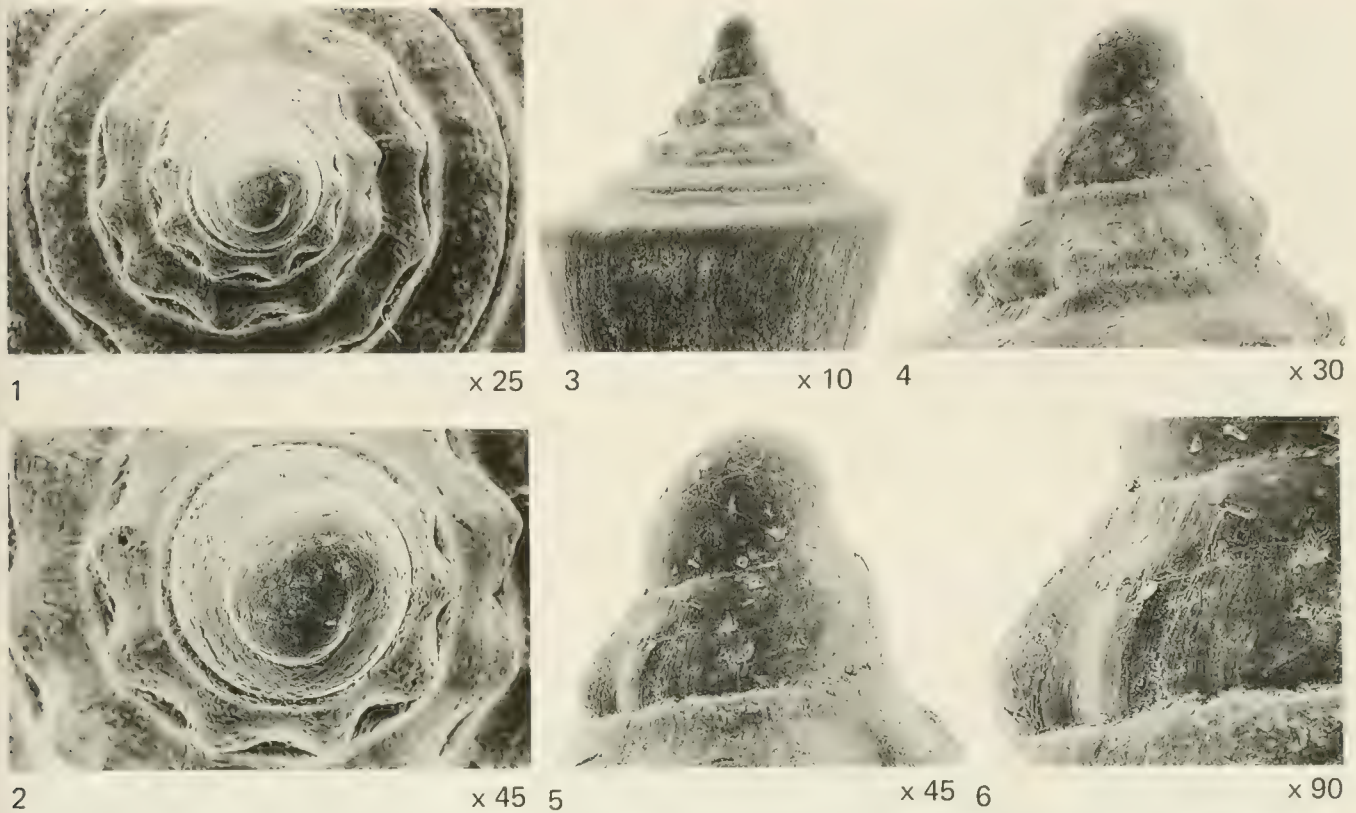
Subgenus **DOMINITARIA**, new subgenus

Derivation of name.—*Dominitaria* is an artificial combination of syllables referring to the word “Dominican” and using the ending of *Parametaria*.

Type species (herein designated).—*Columbella (Meta) islahispaniolae* Maury (1917a, p. 93, pl. 15, fig. 3). Cercado Formation (late Miocene) of the northern Dominican Republic.

Diagnosis.—Shell of small size (8–16 mm in height), coniform, moderately slender. Protoconch consists of a little more than one and a half volutions. Teleoconch whorls five to seven. Apical angle variable. Profile of spire whorls more or less concave to slightly convex. The first two to three and a half teleoconch whorls sculptured by knobs or axially elongated knobs situated near the abapical suture. There are nine to ten knobs per whorl. Later spire whorls sculptured by slightly opisthocyrt growth lines only. Sculptured early teleoconch whorls more or less shouldered. Late spire whorls shouldered or not shouldered. Body whorl shouldered, smooth except for growth lines and spiral threads near its base. Aperture straight to slightly sigmoid. Outer lip somewhat extended adapically, its inner surface with numerous denticles. Outer lip moderately thickened, but with a thin edge. Columellar callus absent. Posterior canal moderately prominent to well developed. Anterior canal straight.

Remarks.—The subgenus *Dominitaria* is distinguished from *Parametaria* s.s. mainly by the sculptured early teleoconch whorls and the higher spire. Jung (1989, p. 38) pointed out that “the presence or absence of sculpture on early teleoconch whorls seems to be a fairly important diagnostic feature” on the sub-



Text-figure 10.—*Parametaria (Dominitaria) islahispaniolae* (Maury, 1917a). NMB H 17412. NMV locality 16836: Río Cana section, Dominican Republic; upper part of Cercado Formation (late Miocene). 1. apical view, $\times 25$; 2. apical view, $\times 45$; 3. spire, $\times 10$; 4. protoconch, $\times 30$; 5. protoconch, $\times 45$; 6. transition protoconch-teleoconch, $\times 90$.

generic level. In addition the species of *Dominitaria* are smaller than those of the subgenus *Parametaria*.

So far only two species are assigned to *Dominitaria*. In geographic distribution they are restricted to the northern Dominican Republic, and stratigraphically they occur in the Baitoa Formation (late early to early middle Miocene) on one hand, and on the other hand in the Cercado and Gurabo Formations (late Miocene to early Pliocene).

***Parametaria (Dominitaria) islahispaniolae*
(Maury, 1917a)**

Plate 6, figures 1–15; Plate 7, figures 1–3
Text-figures 10–12

Columbella (Meta) islahispaniolae Maury, 1917a, p. 93, pl. 15, fig. 3.

Description.—Shell of small size (8–16 mm in height), coniform, moderately slender. Protoconch consists of a little more than one and a half volutions; its outer lip opisthocline to slightly opisthocyrt. Teleoconch whorls five to seven. Profile of spire whorls more or less concave. The first two to three teleoconch whorls are sculptured by knobs or axially elongated knobs situated near the abapical suture and sometimes overhanging it.

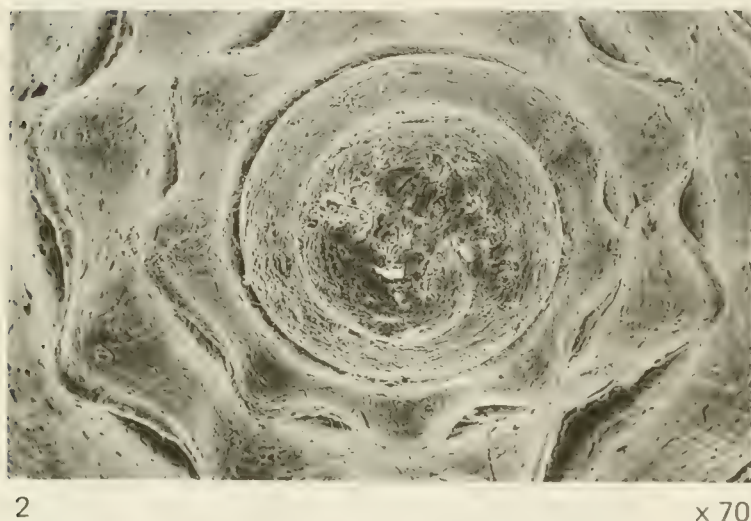
There are nine to ten knobs on the first teleoconch whorl. Later spire whorls sculptured only by slightly opisthocyrt growth lines. Late spire whorls shouldered. Height of spire variable, *i.e.*, apical angle not constant. Body whorl shouldered and practically not inflated; sculptured by growth lines and spiral threads near its base. Aperture straight to slightly sigmoid. Outer lip somewhat extended adapically; its inner surface with numerous denticles. Outer lip moderately thickened, but with a thin edge. Columellar callus absent. Posterior canal moderately prominent. Anterior canal straight.

Holotype.—PRI 28727. Plate 6, figures 1–3.

Dimensions of holotype.—Height 11.2 mm; width 5.8 mm.

Type locality.—Cercado de Mao, Bluff 3 of Maury. Cercado Formation (late Miocene). See Saunders *et al.*, 1986, text-fig. 29.

Remarks.—This species is represented by numerous specimens. They show that the height of the spire is variable. Low-spired specimens (Pl. 6, figs. 4–6) look rather unlike high-spired specimens (Pl. 6, figs. 7–9). The holotype is an intermediate specimen as to height of the spire. An unusually large, low-spired specimen



Text-figure 11.—*Parametaria (Dominitaria) islahispaniolae* (Maury, 1917a). NMB H 17413. NMB locality 16828: Río Cana section, Dominican Republic; lowest part of Gurabo Formation (late Miocene). 1. apical view, $\times 30$; 2. apical view, $\times 70$; 3. early whorls, $\times 20$; 4. protoconch, $\times 70$.

(Pl. 7, figs. 1–3) carries a few spiral ribs on the lower half of its outer lip. Low-spired and high-spired specimens may be found in the same lot. Thus the variable height of the spire is considered as true intraspecific variability.

Comparisons.—Comparative remarks are given under *P. lopezana*, n. sp.

Material.—Twelve lots with a total of 89 specimens as listed below:

1. 1 spec., PRI 28727: holotype; Bluff 3, Cercado de Mao; Cercado Formation (late Miocene).

2. 8 spec., NMB locality 16817: Río Cana section; lower part of Gurabo Formation (early Pliocene).

3. 8 spec., NMB locality 16818: Río Cana section; lower part of Gurabo Formation (early Pliocene).

4. 1 spec., NMB locality 16820: Río Cana section; lowest part of Gurabo Formation (latest Miocene).

5. 23 spec., NMB locality 16828: Río Cana section; lowest part of Gurabo Formation (latest Miocene).

6. 6 spec., NMB locality 16835: Río Cana section; upper part of Cercado Formation (late Miocene).

7. 7 spec., NMB locality 16836: Río Cana section; upper part of Cercado Formation (late Miocene).

8. 13 spec., NMB locality 16844: Río Cana section; upper part of Cercado Formation (late Miocene).

9. 5 spec., NMB locality 16879: Río Cana section; lower part of Gurabo Formation (early Pliocene).

10. 2 spec., NMB locality 16913: Río Mao section (same as Maury's Bluff 3); Cercado Formation (late Miocene).

11. 13 spec., NMB locality 16928: Arroyo Bajón on Río Mao; Cercado Formation (late Miocene).

12. 2 spec., NMB locality 16929: Río Mao, about 50 m upstream from Maury's Bluff 2; Cercado Formation (late Miocene).

Measurements.—Plotted in Text-figure 12.

Occurrence.—Río Mao section: Cercado Formation (late Miocene); NMB localities 16913, 16928, 16929. Río Cana section: in this section the species occurs in the Cercado and the Gurabo Formations. Cercado Formation (late Miocene): NMB localities 16835, 16836, 16844; Gurabo Formation (latest Miocene part of the Formation): NMB localities 16820, 16828; Gurabo Formation (early Pliocene part of the formation): NMB localities 16817, 16818, 16879. See Saunders *et al.*, (1986, text-figs. 15, 16, 29, 30).

Distribution.—Not known from outside the Dominican Republic.

***Parametaria (Dominitaria) lopezana*, new species**

Plate 7, figures 4–9

Derivation of name.—Named after the López section, the type locality.

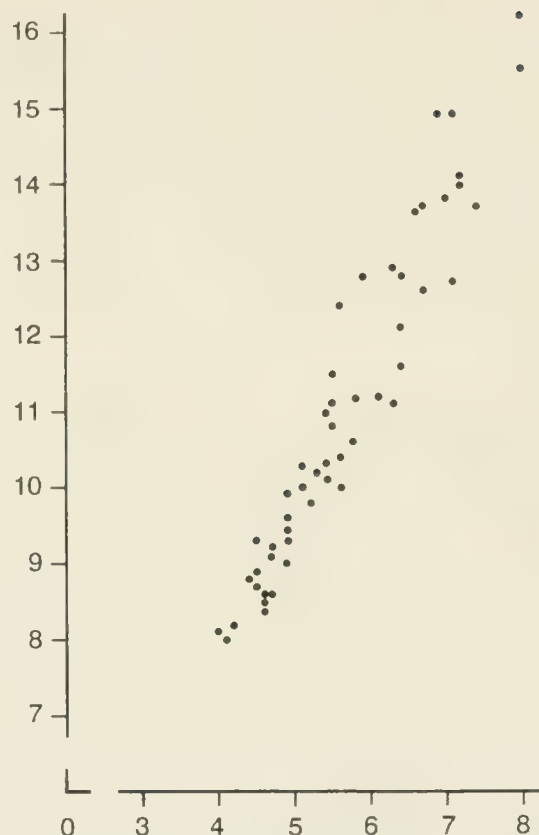
Description.—Shell of small size (10–15 mm in height), coniform, fairly slender. Protoconch probably consists of about one and a half volutions. Teleoconch whorls five to six and a half. Profile of teleoconch whorls slightly concave to moderately convex. The first three to three and a half teleoconch whorls are sculptured by knobs situated near the abapical suture and sometimes overhanging it. There are 11 to 12 knobs on the first teleoconch whorl. Later spire whorls sculptured only by slightly opisthocyrte growth lines. Late spire whorls slightly shouldered and moderately convex in profile. Body whorl slightly shouldered, very little inflated, sculptured by growth lines and a few spiral threads near its base. Aperture slightly sigmoid. Outer lip somewhat extended adapically; its inner surface with numerous denticles. Outer lip not much thickened, with a thin edge. Columellar callus absent. Posterior canal well developed. Anterior canal straight.

Holotype.—NMB H 17414. Plate 7, figures 4–6.

Dimensions of holotype.—Height 11.9 mm; width 5.7 mm.

Type locality.—NMB locality 16936: López section on Río Yaque del Norte; Baitoa Formation (late early to early middle Miocene) (Saunders *et al.*, 1986, p. 30, text-figs. 21, 25).

Remarks.—This new species is represented by five specimens only. In the above description it is stated that the protoconch consists of about one and a half volutions. This is an assumption, however, because no complete protoconch is preserved. Although the state of preservation is unsatisfactory, the shape of its outer



Text-figure 12.—(Restored) height/width diagram of *Parametaria (Dominitaria) islahispaniolae* (Maury, 1917a).

lip seems to be opisthocline. The figured paratype (Pl. 7, figs. 7–9) is the largest specimen. The sculpture on its early teleoconch whorls is weak, and the suture of its late spire whorls is somewhat channelled.

Comparisons.—The general shape of *P. lopezana* is less coniform than that of *P. islahispaniolae*. *P. lopezana* is more slender, i.e., its apical angle is smaller. The sculpture on the early teleoconch whorls is less prominent in *P. lopezana*. The shoulder of the spire and body whorls is more pronounced in *P. islahispaniolae*. The unsculptured spire whorls of *P. lopezana* are convex in profile, whereas the profile of the corresponding whorls of *P. islahispaniolae* is concave to almost straight. The aperture of *P. lopezana* is more sigmoid, and the posterior canal is more pronounced than that of *P. islahispaniolae*.

Material.—Three lots with a total of only five specimens as listed below (all from the late early to early middle Miocene Baitoa Formation):

1. 3 spec., NMB locality 16936: López section on Río Yaque del Norte.

2. 1 spec., TU locality 1363: Arroyo Hondo, López section on Río Yaque del Norte.

3. 1 spec., TU locality 1364: mouth of Arroyo Hondo, López section of Río Yaque del Norte.

Table 7.—Measurements of *Parametaria* (*Dominitaria*) *lopezana*, new species. Figures are in mm.

	restored height	width
NMB H 17414: holotype (Pl. 7, figs. 4–6)	12.0	5.7
NMB H 17415: paratype (Pl. 7, figs. 7–9)	15.3	6.2
NMB H 17416/1; NMB locality 16936	11.3	5.2
NMB H 17416/2; NMB locality 16936	10.2	4.7
NMB H 17417; TU locality 1364	13.7	6.8

Measurements.—See Table 7.

Occurrence.—López section of Río Yaque del Norte; Baitoa Formation (late early to early middle Miocene) (Saunders *et al.*, 1986, p. 30, text-figs. 21, 25). Localities NMB 16936, TU 1363, TU 1364.

Distribution.—Not known from outside the Dominican Republic.

Genus CONELLA Swainson, 1840

Conella Swainson, 1840, pp. 149, 312.

Type species (by monotypy).—*Conella picata* Swainson, 1840 (= *Columbella ovulata* Lamarck, 1822). Recent, West Indies.

Diagnosis.—Shell of small to medium size (12–20 mm in height), biconical, slender to moderately stout. Protoconch consists of one to two volutions. Teleoconch whorls usually six in number. Profile of teleoconch whorls straight to somewhat convex. Body whorl little to moderately inflated, not shouldered. Sculpture consists of spiral threads, which are either restricted to the basal part of the body whorl or also developed on the spire whorls and the adapical part of the body whorl. Growth lines inconspicuous. Aperture narrow, almost straight. Outer lip moderately thickened, extended adapically, with denticles on its inner surface. Columella with a thin callus. Anterior canal short and straight. Posterior canal moderately prominent.

Remarks.—Radwin (1978, p. 333) designated the type locality of *C. ovulata*, the type species of the genus, as “St. Thomas, Virgin Islands”, and he presumed that the holotype of the species was deposited in the Geneva Museum. Inquiries about the type specimen of *Columbella ovulata* Lamarck resulted in the following information received from Dr. Yves Finet of the Natural History Museum in Geneva (written commun., February 25, 1988):

Though there is also a manuscript card made by Mermod, mentioning “mult. éch. in Deless.”, I could not find any specimen of this species in the Lamarck or Delessert collection, nor in our general collection. There is nothing registered as *C. ovulata* in our general index file, nor in the index file of our types. In

An. s. vert., Rosalie de Lamarck mentioned 2 specimens in the collection of her father, but Mermod wrote “type non identifiable”. But I wonder where could be the specimens evoked by Mermod. . .

The designation of a specimen from St. Thomas, Virgin Islands, as the neotype of *Columbella ovulata* Lamarck would be invalid. A relatively small specimen (height 14 mm) from St. Thomas (AMNH 10160) has been figured by Coomans (1967, fig. 1).

Radwin (1978, p. 334) has pointed out the differences between the two living Caribbean species of *Conella*, *C. ovulata* (Lamarck) (1922, p. 295) and *C. ovuloides* (C. B. Adams) (1850, p. 53). *C. ovuloides* is in general more slender than *C. ovulata* (see Radwin, 1978, figs. 9, 10). Abbott (1974, p. 197, figs. 2079, 2080) figured the two species as well, but unfortunately the numbers of the two figures are reversed. The lectotype of *C. ovuloides* (selected by Clench and Turner, 1950, p. 321, pl. 41, fig. 4) is refigured here (Pl. 8, figs. 1–6) for comparison.

A third living species has been described from Brazil by Rios and Tostes (1981, p. 178, figs. 1–3) under the name *Pyrene (Conella) ledalucia*. This species is not only considerably larger than *C. ovulata* and *C. ovuloides*, but has a protoconch (Rios and Tostes, 1981, fig. 2), which is totally unlike that of *C. ovulata* or *C. ovuloides*. It should therefore not be assigned to the genus *Conella*.

The only fossil record of species of *Conella* is *C. perplexabilis* (Maury) from the late Miocene of the Dominican Republic, which is described below. The stratigraphic range of the genus is therefore late Miocene to Recent.

The statement of Radwin (1978, p. 334) that *C. ovuloides* had been recorded by Brown and Pilsbry (1913) from the Pleistocene of Panama is an error.

Conella perplexabilis (Maury, 1917a)

Plate 8, figures 7–9, 13–15

Text-figure 13

Columbella (Meta) perplexabilis Maury, 1917a, p. 94, pl. 15, figs. 4, 5.

Description.—Shell of small to medium size (12–17 mm in height), biconical, moderately stout. Protoconch consists of one and a half volutions; its outer lip is opisthocline and slightly opisthocyrt. Teleoconch whorls up to six and a half in number. Profile of teleoconch whorls straight to somewhat convex. Body whorl moderately inflated, not shouldered. Sculpture consists of spiral threads near the base of the body whorl. Growth lines not conspicuous. Aperture narrow, almost straight. Outer lip moderately thickened, extended adapically, with denticles on its inner surface.

Columella with a thin callus. Anterior canal short and straight. Posterior canal moderately prominent.

Holotype.—PRI 28728. See Plate 8, figures 7–9.

Dimensions of holotype.—Height 12.7 mm; width 6.2 mm.

Type locality.—Bluff 3 of Maury, Cercado de Mao; Cercado Formation (late Miocene). For location see Saunders *et al.*, 1986, text-fig. 29.

Remarks.—Although this species is not particularly rare, there is no protoconch preserved well enough to be suitable for scanning electron micrography. The holotype is a rather small specimen; it has only five and a half teleoconch whorls and therefore has a somewhat more slender appearance than other specimens.

Comparisons.—The only species with which *C. perplexabilis* can be compared is the living Caribbean *C. ovulata* (Lamarck) (1882, p. 295). Both species have a similar degree of stoutness. *C. perplexabilis* differs from *C. ovulata* by the lack of spiral sculpture on the spire whorls and on the adapical part of the body whorl. *C. ovuloides* (C. B. Adams) (1850, p. 53) is considerably more slender than *C. perplexabilis*. Its lectotype (selected by Clench and Turner, 1950, p. 321, pl. 41, fig. 4) is refigured here for comparison (Pl. 8, figs. 1–6).

Material.—Five lots with a total of 26 specimens as listed below. All specimens have been collected from the late Miocene Cercado Formation.

1. 3 spec., NMB locality 16913: Río Mao; corresponds to Bluff 3 of Maury.
2. 3 spec., NMB locality 16927: Río Mao, at mouth of Arroyo Bajón.
3. 6 spec., NMB locality 16928: Río Mao, near mouth of Arroyo Bajón.
4. 9 spec., TU locality 1294: Río Mao; corresponds to Bluff 3 of Maury.
5. 5 spec., TU locality 1379: Río Mao, around mouth of Arroyo Bajón.

Measurements.—Plotted in Text-figure 13.

Occurrence.—This species is recorded only from the late Miocene Cercado Formation of the Río Mao section: NMB localities 16913, 16927, 16928, and TU localities 1294, 1379. For location see Saunders *et al.* (1986, text-fig. 29).

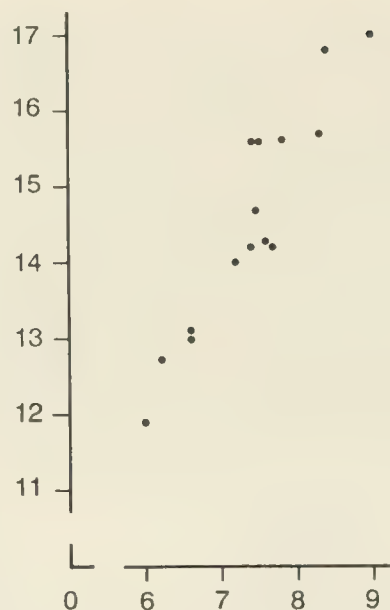
Distribution.—Not known from outside the Dominican Republic.

Genus *NITIDELLA* Swainson, 1840

Nitidella Swainson, 1840, p. 313.

Type species (by monotypy).—*Nitidella marmorata* Swainson (1840, p. 151, fig. 17c.) (= *Columbella nitida* Lamarck, 1822, p. 295). Recent, West Indies.

Diagnosis.—Shell of small to medium size (10–19 mm in height), moderately slender. Protoconch con-



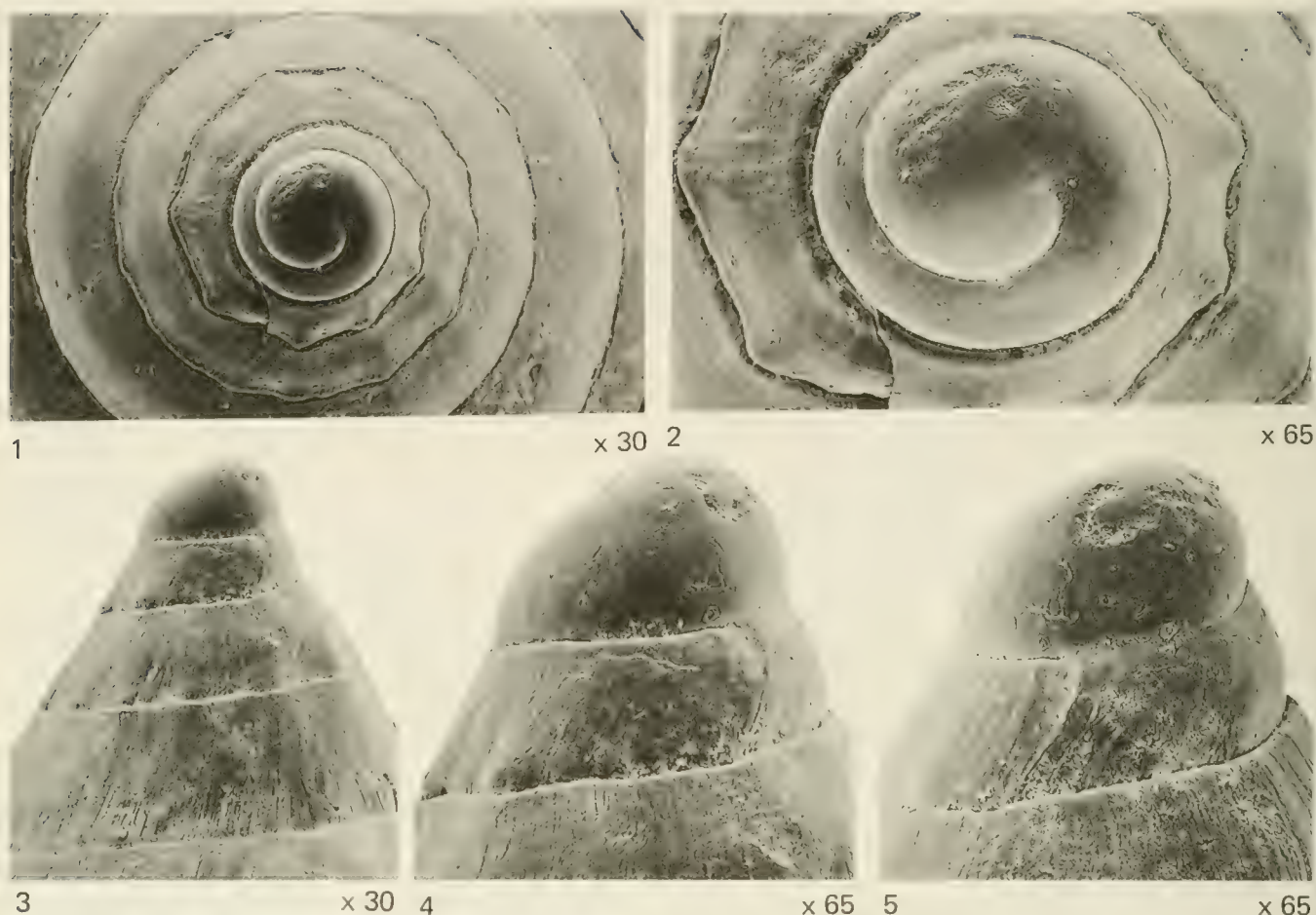
Text-figure 13.—(Restored) height/width diagram of *Conella perplexabilis* (Maury, 1917a).

sists of about one and a half volutions; its outer lip slightly opisthocyrte. Teleoconch whorls five to six in number. Profile of early teleoconch whorls straight, of later spire whorls somewhat convex. Body whorl little inflated, not shouldered. Besides orthocone to slightly opisthocline growth lines all the whorls are smooth with the exception of the early teleoconch whorls, which may be sculptured by more or less conspicuous, practically orthocone ribs. Aperture moderately narrow. Outer lip not greatly thickened, somewhat extended adapically, its inner surface with more or less well developed denticles or smooth. Columella smooth, with two weak plications, or with denticles. Anterior canal straight, short, and wide. Posterior canal inconspicuous.

Remarks.—In an attempt to see and refigure the type specimen of *Columbella nitida* Lamarck, 1822 I have received the following information from Dr. Yves Finet of the Natural History Museum in Geneva (written communication, February 25, 1988):

“In our original volumes of *Anim. s. vert.*, Lamarck’s daughter, Rosalie de Lamarck, made manual annotations that mention the number of specimens originally present in her father’s collection. For *C. nitida*, she wrote “21 specimens” (= syntypes).

There is no *C. nitida* in our Lamarck collection, but 2 lots of 15 specimens of this species in our general collection, from the Delessert collection (letter D left and above on the cardboard plate). In the index file that Mermod made for the species described by Lamarck and eventually present in our Lamarck collection, he mentioned that one of these



Text-figure 14.—*Nitidella cibaoica* (Maury, 1917a). NMB H 17421. NMB locality 16934: Río Gurabo section, Dominican Republic; lower part of Gurabo Formation (late Miocene). 1. apical view, $\times 30$; 2. apical view, $\times 65$; 3. early whorls, $\times 30$; 4. protoconch, $\times 65$; 5. protoconch and transition to teleoconch, $\times 65$.

30 specimens is probably the one figured by Kiener (pl. 15, fig. 1) and possibly could be the type. But this is not certain. I think that a lectotype has to be designated, eventually the specimen pointed out by Mermoud."

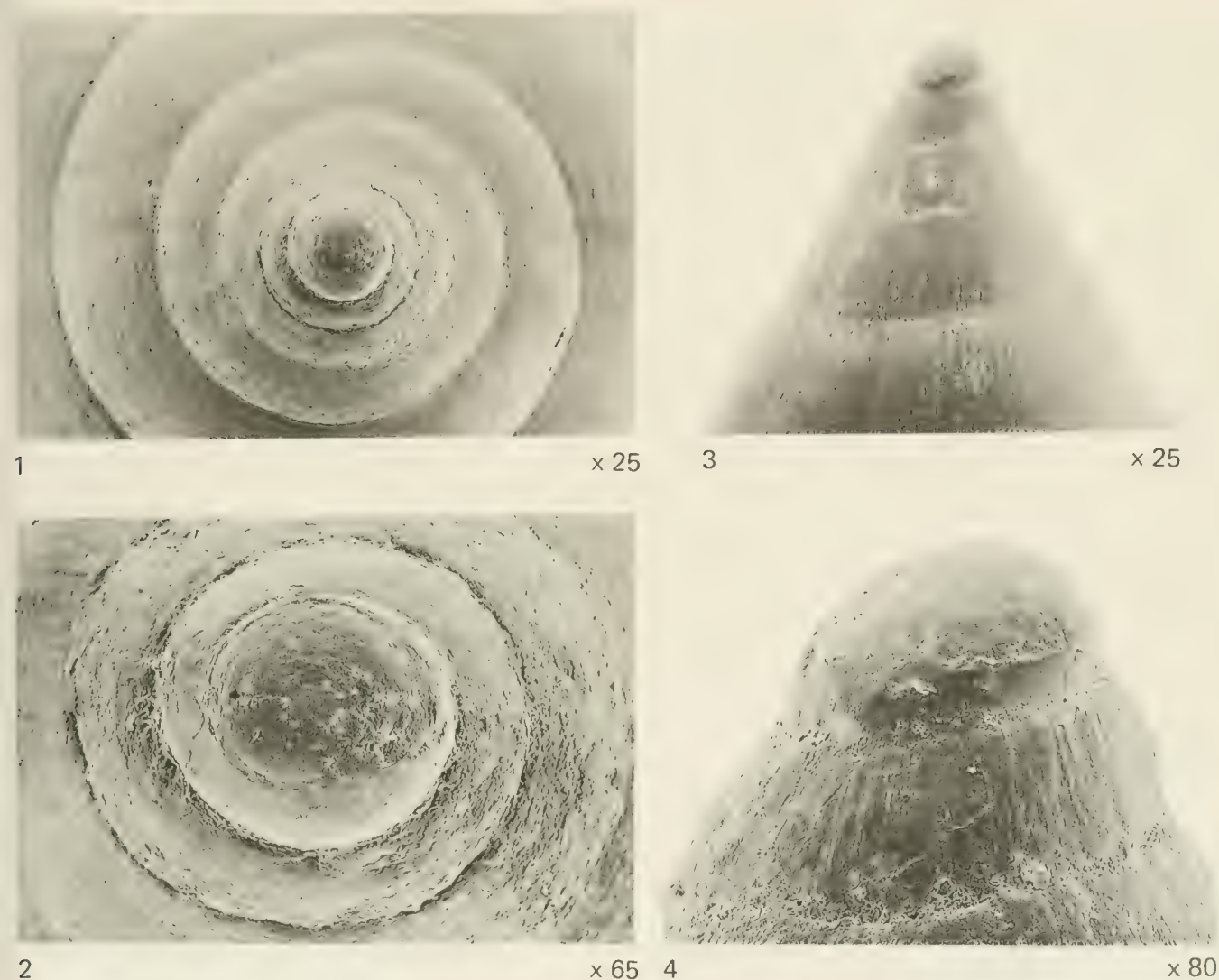
After comparison of the figure given by Kiener (1834–1880, pl. 15, fig. 1, 1841) with the specimen mentioned above, of which Mermoud thought it might correspond to Kiener's figure, it is obvious that this is not so. The protoconch of the specimen is strongly eroded, whereas the figure shows a pointed apex. In addition the color pattern does not match. There is no evidence that any of the specimens from the Delessert collection were ever part of the original Lamarck collection. For this reason it is not advisable to select a lectotype. On the contrary: it would be preferable to designate a specimen with good locality information as the neotype of *Columbella nitida* Lamarck. I hesitate to designate a neotype of the species, however, without having stud-

ied the history of the case in more detail than has been possible here.

N. nitida is widespread in the living fauna of the Caribbean Province. Contrary to the statement by Radwin (1977a, p. 414) it does not occur in the Pleistocene of Venezuela. Although Weisbord (1962, p. 320) recorded *N. nitida* from the Distrito Federal, Venezuela, he figured only Recent specimens and stated that "not a single fossil specimen was observed . . .". The only fossil species of *Nitidella* I am aware of is *N. cibaoica* (Maury) from the late Miocene of the Dominican Republic, which is described below. The stratigraphic range of *Nitidella* is therefore late Miocene to Recent.

***Nitidella cibaoica* (Maury, 1917a)**
Plate 9, figures 1–12
Text-figures 14, 16

Columbella (*Nitidella*) *cibaoica* Maury, 1917a, p. 99, pl. 21, figs. 3, 4.



Text-figure 15.—*Nitidella nitida* (Lamarck, 1822). NMB H 17422. NMB locality 17704: Isla de Aves, Venezuela; recent. 1. apical view, $\times 25$; 2. apical view, $\times 65$; 3. early whorls, $\times 25$; 4. protoconch $\times 80$.

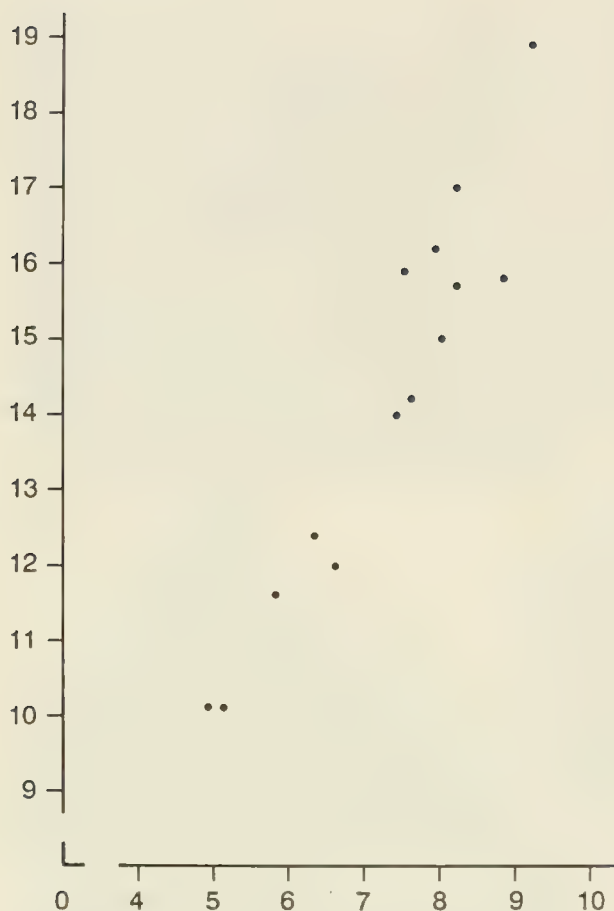
Description.—Shell of small to medium size (10–19 mm in height), moderately slender. Protoconch consists of about one and a half volutions; its outer lip slightly opisthocyrt. Teleoconch whorls usually six in number. The profile of the first two teleoconch whorls is straight; they are sculptured by inconspicuous, orthocline ribs, which are more prominent abapically. There are about 15 ribs per whorl. The subsequent whorls have a somewhat convex profile and are smooth except for faint, practically orthocline growth lines. Body whorl not greatly inflated. Aperture moderately narrow. Outer lip thickened, somewhat extended adapically, its inner surface with numerous more or less prominent denticles. Columella smooth or with two hardly recognizable plications. Anterior canal straight, short, and wide. Posterior canal inconspicuous.

Lectotype (herein selected).—PRI 28794. See Plate 9, figures 1–3.

Dimensions of lectotype.—Height 15.0 mm; width 8.0 mm.

Type locality.—Río Cana at Caimito; Cercado Formation (late Miocene). For location see Saunders *et al.* (1986, text-fig. 15).

Remarks.—*N. cibaoica* is not a common species. The denticles on the inner surface of the outer lip are usually well developed, but not so in the lectotype and the figured paralectotype (Pl. 9, figs. 4–6). The orthocline ribs on the early teleoconch whorls are sometimes poorly developed and hardly recognizable. The figured specimens from the Río Gurabo section (Pl. 9, figs. 7–12) are larger than the average size of the available material.



Text-figure 16.—(Restored) height/width diagram of *Nitidella cibaoica* (Maury, 1917a).

Comparisons.—To my knowledge the living Caribbean *N. nitida* (Lamarck) (1822, p. 295) is the only other species of *Nitidella* so far described. *N. cibaoica* (Maury) mainly differs from *N. nitida* by having sculptured early teleoconch whorls. In addition the denticles on the inner surface of the outer lip are usually more

Measurements.—Plotted in Text-figure 16.

Occurrence.—Cercado Formation (late Miocene) of the Río Cana section: NMB locality 16856 and TU locality 1420. Lower part of Gurabo Formation (late Miocene) of the Río Gurabo section: NMB localities 15849, 15857, 16934. For location see Saunders, Jung, and Biju-Duval (1986, text-figs. 4, 6, 15, 16).

strongly developed in *N. cibaoica*. Two recent specimens of *N. nitida* from Isla de Aves, Venezuela, are figured for comparison (Pl. 9, figs. 13–18; Text-fig. 15).

Material.—Five lots with a total of 19 specimens as listed below:

1. 1 spec., NMB locality 15849: Río Gurabo; lower part of Gurabo Formation (late Miocene).
2. 1 spec., NMB locality 15857: Río Gurabo; lower part of Gurabo Formation (late Miocene).

3. 8 spec., NMB locality 16856: Río Cana; Cercado Formation (late Miocene).

4. 4 spec., NMB locality 16934: Río Gurabo; lower part of Gurabo Formation (late Miocene).

5. 5 spec., TU locality 1420: Arroyo Bellaco, tributary of Río Cana; most probably Cercado Formation (late Miocene).

Distribution.—Not known from outside the Dominican Republic.

***Nitidella* aff. *cibaoica* (Maury, 1917a)**

Plate 8, figures 10–12

Remarks.—This form is represented by a single specimen from TU locality 1250 (Río Verde; age probably early Pliocene) (for location see Saunders *et al.*, 1986, text-fig. 38). Its protoconch is not preserved. The general appearance is stouter than that of *N. cibaoica*. The shell consists of almost seven teleoconch whorls. The profile of the early teleoconch whorls is straight, that of the subsequent whorls moderately convex. The first three and a half teleoconch whorls are sculptured by orthocone to slightly opisthocline ribs, which are considerably more prominent in their abapical part. There are 12 to 15 ribs per whorl. The aperture is narrower than that of *N. cibaoica*. The inner surface of the outer lip carries prominent denticles. The columella is covered by a callus with six denticles. The posterior canal is more prominent than that of *N. cibaoica*. This shell obviously represents a new species. I feel, however, that more material is needed to describe it formally.

***Nitidella caimitana*, new species**

Plate 8, figures 16–21

Derivation of name.—Named after Caimito on Río Cana, the type locality.

Description.—Shell of small size (six to eight mm in height), slender. Protoconch consists of one and a half to two volutions; the shape of its outer lip is not known. Number of teleoconch whorls five and a half. Profile of early teleoconch whorls straight, of later whorls slightly convex. Except for faint, orthocone growth lines all the teleoconch whorls are smooth. Body whorl only slightly inflated. Aperture narrow, slightly sigmoid. Outer lip thickened, only slightly extended adapically, its inner surface with numerous, well developed denticles. Columella with two plications. Anterior canal straight, short, and moderately narrow. Posterior canal inconspicuous.

Holotype.—NMB H 17425. See Plate 8, figures 16–18.

Dimensions of holotype.—Height 7.2 mm; width 3.4 mm.

Type locality.—TU 1230: Río Cana at Caimito; Cer-

cado Formation (late Miocene). For location see Saunders *et al.*, (1986, text-fig. 15).

Remarks.—This species is represented by a single lot containing only three specimens. This is admittedly a low number of specimens upon which to base a new species. *N. caimitana*, however, is so similar to *N. nitida* (Pl. 9, figs. 13–18 for comparison), however, that it may be its ancestor and therefore well worth being described formally.

Although the protoconch of the holotype is preserved, its preservation is not good enough to recognize the shape of its outer lip; the number of its volutions as indicated in the above description is therefore not fully reliable. The figured paratype is lacking its protoconch. The unfigured paratype has its protoconch, but the surface of the whole shell is eroded.

Comparisons.—*N. caimitana* is not only smaller than *N. cibaoica*, but it lacks the axial sculpture on the first teleoconch whorls. In this latter respect it is like the living *N. nitida*. *N. nitida* and *N. caimitana* have about the same number of teleoconch whorls, but *N. caimitana* is considerably smaller. The prominence of the denticles on the inner surface of the outer lip is variable in *N. nitida*; sometimes they are hardly developed. In the available material of *N. caimitana* they are conspicuous.

Material.—One lot with a total of only three specimens as listed below:

1. 3 spec., TU locality 1230: Río Cana at Caimito; Cercado Formation (late Miocene).

Measurements.—See Table 8.

Occurrence.—Cercado Formation (late Miocene) of the Río Cana section: TU locality 1230.

Distribution.—Not known from outside the Dominican Republic.

Genus *METULELLA* Gabb, 1873a

Metulella Gabb, 1873a, p. 270.

Type species (by original designation).—*Metulella fusiformis* Gabb, 1873b. Neogene, Dominican Republic.

Diagnosis.—Shell of small to medium size (10–30 mm in height), slender. Protoconch consists of a little less than two volutions; its outer lip is slightly opisthocyrt. Number of teleoconch whorls six to nine. Profile of teleoconch whorls straight to moderately convex. Suture usually strongly incised. Sculpture of teleoconch whorls consists of conspicuous axial ribs and less prominent spiral threads. Body whorl moderately inflated. Aperture narrow. Outer lip moderately thickened, with prominent denticles on its inner surface. Columella with a callus carrying denticles. Anterior canal narrow, moderately long to long. Posterior canal inconspicuous.

Table 8.—Measurements of *Nitidella caimitana*, new species. Figures are in mm.

	restored height	width
NMB H 17425: holotype (Pl. 8, figs. 16–18)	7.2	3.4
NMB H 17426: figured paratype	8.0	3.7
NMB H 17427: unfigured paratype	5.7	2.7

Remarks.—*Metulella columbellata* (Dall) (1889, p. 182), known from the Recent fauna of the Gulf of Mexico, was first figured by Dall (1890, pl. 6, fig. 8). According to Radwin (1977b, p. 126, fig. 19) it is the only living species of the genus, and its habitat seems to be restricted to deeper water. Unfortunately no material of *M. columbellata* is available for comparison. The collection Gibson-Smith, however, contains two apparently undescribed species collected in Venezuelan waters. All these three living species have fewer teleoconch whorls than the fossil species described below. The protoconch of *M. columbellata* as shown in the figure given by Dall (1890, pl. 6, fig. 8) is quite similar to those of the two fossil species recorded herein. On the other hand the protoconch of the Venezuelan material mentioned above is quite different: the apex is pointed, and there are almost three volutions.

In his discussion of the genus *Metulella* Woodring (1928, p. 278) proposed to use the subgeneric name *Metulella* for slender species with a long anterior canal and the subgeneric name *Thiarinella* Sacco (1890) for stout species with a short anterior canal. As a consequence he assigned *M. fusiformis* to the subgenus *Metulella* and *M. venusta*, which is described below, to *Thiarinella*. *Fusus comptus* Bronn, 1831, is the type species of *Thiarinella*. According to the description and figure given by Sacco (1890, p. 56, pl. 2, fig. 74) it completely lacks spiral sculpture on the spire whorls. It therefore seems advisable to consider *Metulella* as a genus with Caribbean distribution only.

Metulella (Thiarinella) olssoni Perrilliat (1972, p. 90, pl. 42, figs. 7–16) from the Agueguexquite Formation (early Pliocene) of Mexico is a species of the subgenus *Lirastrombina* Jung (1989, p. 96). Erroneously it has not been discussed by Jung (1989).

The stratigraphic range of the genus *Metulella* as understood here is late Miocene to Recent.

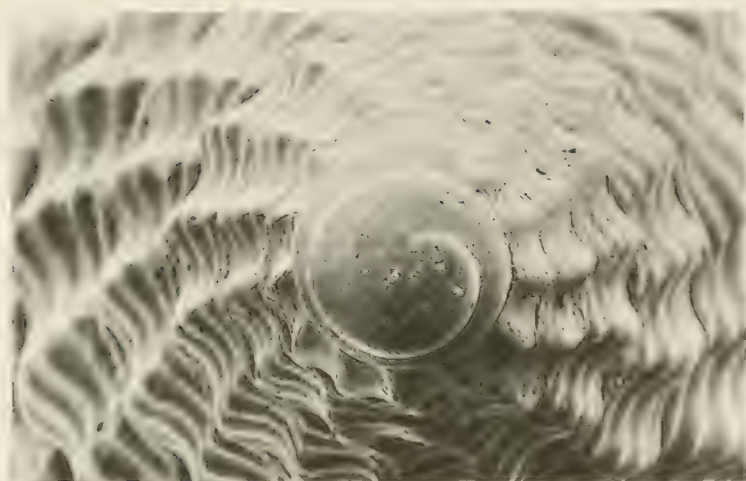
Metulella fusiformis Gabb, 1873a

Plate 10, figures 1–17

Text-figures 17, 18

Metulella fusiformis Gabb, 1873a, p. 270, pl. 11, fig. 3. Gabb, 1873b, p. 206. Maury, 1917a, p. 89, pl. 15, fig. 28. Pilsbry, 1922, p. 352, pl. 18, fig. 16.

Metulella williamgabbii Maury, 1917a, p. 90, pl. 15, fig. 29. Pilsbry, 1922, p. 352.



1

× 30



3

× 25



2

× 50



4

× 50

Text-figure 17. — *Metulella tusiformis* Gabb, 1873a. NMB H 17429. NMB locality 17266: La Barranca on Rio Yaque del Norte, Dominican Republic; upper part of *Globorotalia margaritae* zone (late early Pliocene). 1. apical view, × 30; 2. apical view, × 50; 3. early whorls, × 25; 4. protoconch and transition to teleconch, × 50.

Metulella dominicensis Pilsbry and Johnson, 1917, p. 169. Pilsbry, 1922, p. 352, pl. 18, fig. 18.

Description.—Shell of small to medium size (15–19 mm in height), slender. Protoconch consists of a little less than two volutions; its outer lip is slightly opisthocyrt. Number of teleconch whorls six and a half to seven and a half. Profile of teleconch whorls only slightly convex to moderately convex. Suture strongly incised. Sculpture of teleconch whorls consists of conspicuous axial ribs and usually less prominent spiral threads. The axial ribs are orthocline to slightly procline, and their number per whorl is 12 on early teleconch whorls and up to 18 on late teleconch whorls. On the first one or two teleconch whorls the spiral threads are poorly developed, but their prominence gradually increases on successive whorls. Their number is four or five on all the teleconch whorls.

Between the lowest spiral thread and the suture there is a narrow but usually steep slope. The lower part of the body whorl is sculptured by spiral threads, but the axial ribs fade out toward the base. Outer lip not strongly thickened; its inner surface with prominent denticles. Inner lip with a callus carrying conspicuous denticles. Anterior canal long and narrow, somewhat recurved.

Lectotype.—ANSP 3216 (selected by Pilsbry, 1922, p. 352). See Plate 10, figures 1–3.

Dimension of lectotype.—Height 18.8 mm; width 6.1 mm.

Type locality.—Santo Domingo. As noted by Pilsbry (1922, p. 307) this is the only indication as to locality that can be found on the original labels of the Gabb collection in the Academy of Natural Sciences in Philadelphia. The same can be said of the type localities of *M. williamgabbii* and *M. dominicensis*, because these

two species are based on material from the Gabb collection. The type locality of *M. fusiformis* is here restricted to NMB locality 17266: La Barranca on Río Yaque del Norte. Its location is given by Saunders *et al.* (1986, text-fig. 21). According to these authors (1986, p. 30) the silts cropping out at NMB locality 17266 are of late early Pliocene age (upper part of *Globorotalia margaritae* Zone).

Holotype of *M. williamgabbi*.—PRI 28745. See Plate 10, figures 9–11.

Dimensions of holotype of *M. williamgabbi*.—Height 16.5 mm; width 5.7 mm.

Type locality of *M. williamgabbi*.—Santo Domingo (see above).

Holotype of *M. dominicensis*.—ANSP 3217. See Plate 10, figures 4–6.

Dimensions of holotype of *M. dominicensis*.—Height 16.4 mm; width 5.2 mm.

Type locality of *M. dominicensis*.—Santo Domingo (see above).

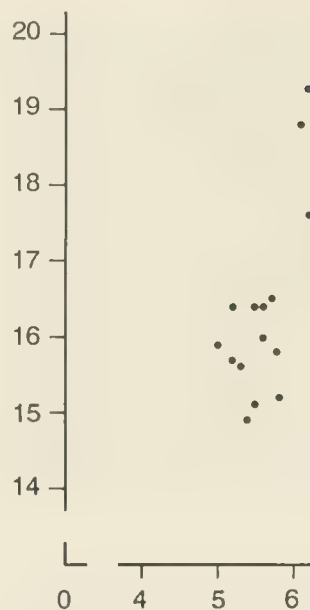
Remarks.—Most authors have considered *M. fusiformis* to be a rare species. The present description of the species is based on enough material to allow for some remarks on variability. The profile of the teleoconch whorls is variable to some degree: it ranges from almost straight to moderately convex. Specimens from Arroyo Zalaya (NMB locality 17271; Pl. 10, figs. 15–17) have a more convex profile than specimens from other localities.

M. williamgabbi and *M. dominicensis* are both based on material from the Gabb collection, and their exact type localities are therefore not known. Pilsbry (1922, p. 352) noted that *M. dominicensis* is “perhaps not distinct from *M. williamgabbi*”. Both have somewhat reduced axial and spiral sculptures, and the profile of their teleoconch whorls is less convex. These features are here considered to fall within the variability of *M. fusiformis*.

Comparisons.—The living *M. columbellata* (Dall) (1889, p. 182) from the Gulf of Mexico basically is a smaller species. It has a larger apical angle, the profile of its teleoconch whorls is practically straight, and its anterior canal is considerably shorter than that of *M. fusiformis*. *M. elongata* (Toula) (1911, p. 478, pl. 29, fig. 8) from the Pliocene (?) of Tehuantepec, Mexico, is obviously closely related to *M. fusiformis*. No topotypes are available for comparison, however. The specimen figured by Toula measures only 11.8 mm in height and is thus smaller than all the specimens of *M. fusiformis* at hand. Judging from Toula’s figure the axial ribs are more prominent, and there seem to be more spiral threads in *M. elongata*.

Material.—Three lots with a total of only 15 specimens as listed below:

1. 7 spec., NMB locality 17266: La Barranca on Río



Text-figure 18.—(Restored) height/width diagram of *Metulella fusiformis* Gabb, 1873a.

Yaque del Norte; upper part of *Globorotalia margaritae* Zone (late early Pliocene).

2. 6 spec., NMB locality 17267: La Barranca on Río Yaque del Norte; upper part of *Globorotalia margaritae* Zone (late early Pliocene).

3. 2 spec., NMB locality 17271: Arroyo Zalaya; *Globorotalia margaritae* Zone (early Pliocene).

Measurements.—Plotted in Text-figure 18.

Occurrence.—*Globorotalia margaritae* Zone (early Pliocene) of La Barranca on Río Yaque del Norte (NMB localities 17266, 17267) and Arroyo Zalaya (NMB locality 17271). For location and age see Saunders *et al.* (1986, pp. 30, 34, text-figs. 21, 36).

Distribution.—Not known from outside the Dominican Republic.

***Metulella venusta* (G. B. Sowerby II, 1850)**

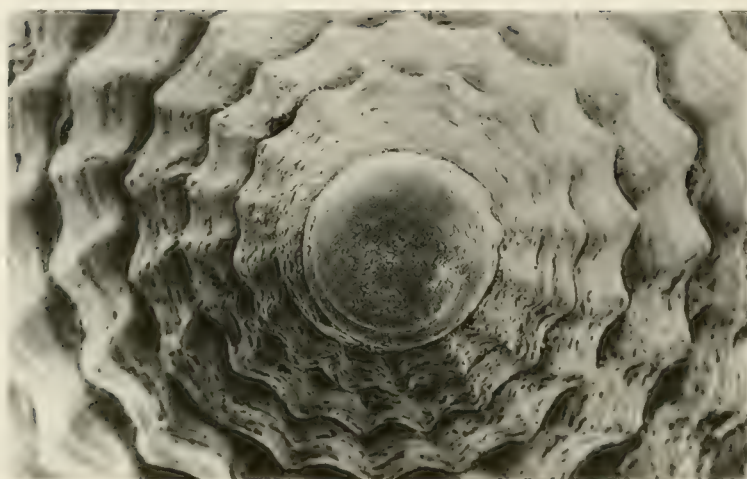
Plate 10, figures 18–20; Plate 11, figures 1–9

Text-figures 19, 20

Columbella venusta G. B. Sowerby II, 1850, p. 46, pl. 9, fig. 6. Guppy, 1876, p. 526.

Metulella venusta Sowerby, Gabb, 1873b, p. 206. Maury, 1917a, p. 89, pl. 15, figs. 26, 27. Pilsbry, 1922, p. 352.

Description.—Shell of medium size (20–30 mm in height), moderately slender. Protoconch consists of a little less than two volutions; its outer lip is slightly opisthocyrte. Number of teleoconch whorls up to nine. Profile of teleoconch whorls moderately convex. Suture incised. Sculpture of teleoconch whorls consists of orthocone to slightly prosocline axial ribs and spiral threads and bands. There are about 17 axial ribs per whorl on early teleoconch whorls and about 27 on late



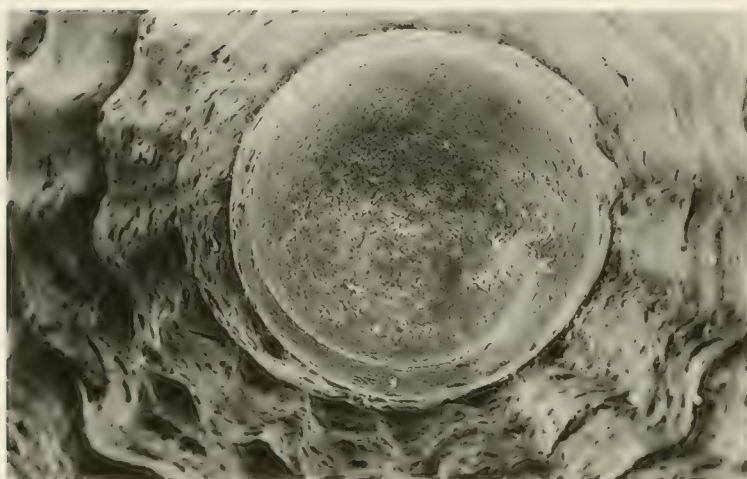
1

x 30



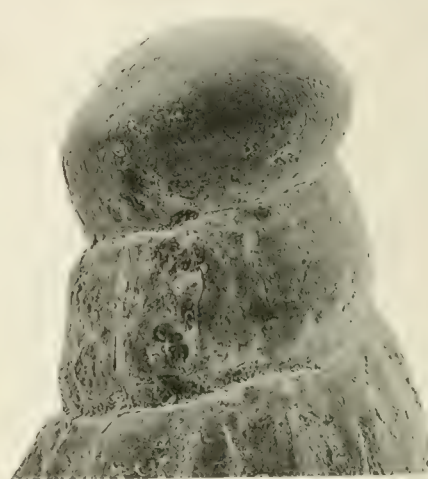
3

x 25



2

x 60



4

x 50

Text-figure 19. — *Metulella venusta* (G. B. Sowerby II, 1850). NMB H 17431. NMB locality 15903: Río Gurabo section, Dominican Republic; Cercado Formation (late Miocene). 1. apical view, $\times 30$; 2. apical view, $\times 60$; 3. early whorls, $\times 25$; 4. protoconch and transition to teleoconch, $\times 50$.

teleoconch whorls. On the first teleoconch whorls the spiral threads are not or only poorly developed, but their prominence gradually increased on successive whorls. On later teleoconch whorls the number of spiral threads and bands is five to six. Sometimes the whorls may be slightly shouldered. The entire height of the body whorl is sculptured by spiral threads and bands, but the axial ribs fade out toward the base. Outer lip moderately thickened, with a fairly sharp edge, its inner surface with well developed denticles. Inner lip with a strong callus carrying prominent denticles. Anterior canal short and practically straight. Posterior canal inconspicuous.

Lectotype (herein selected).—BMNH GG 20044. See Plate 11, figures 1–3. This is the specimen figured by G. B. Sowerby II (1850, pl. 9, fig. 6).

Dimensions of lectotype.—Height 23.4 mm; width 9.5 mm.

Type locality.—The locality information accompanying the lectotype simply states “Yaque River”, Dominican Republic. This general indication is unsatisfactory. Among the available material there is only one specimen from Río Yaque del Norte (NMB locality 17267: La Barranca). The bulk of the material, however, has been collected from the Río Gurabo section and on Río Mao, areas which are not far from the “Yaque River” (Río Yaque del Norte).

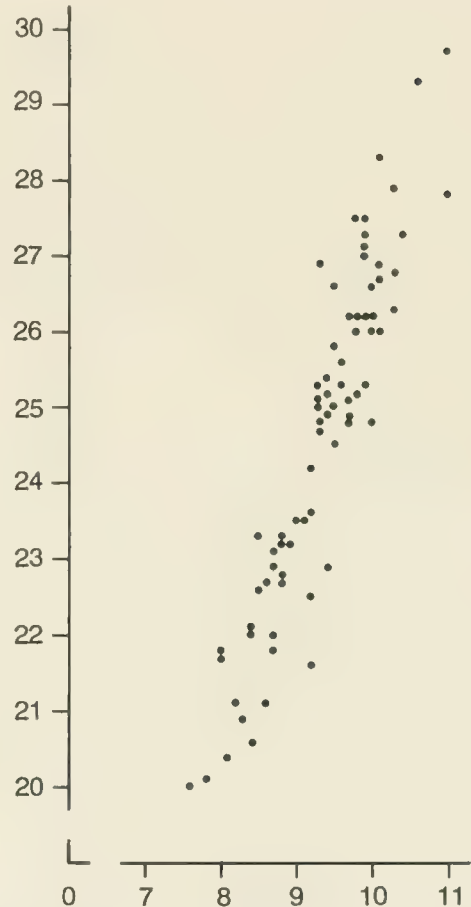
Remarks.—*M. venusta* is a fairly common species. Its morphological characters are more or less constant with the exception that sometimes the spire whorls are somewhat shouldered and not regularly convex.

Comparisons.—*M. venusta* cannot really be com-

pared with *M. fusiformis*. It is not only a considerably larger species, but is stouter, *i.e.*, has a larger apical angle, and has a much shorter anterior canal. In the two latter respects *M. venusta* is closer to the living *M. columbellata* (Dall) (1889, p. 182) from the Gulf of Mexico. *M. columbellata*, however, is much smaller than *M. venusta*, and the profile of its teleoconch whorls is less convex or even straight.

Material.—23 lots with a total of 129 specimens as listed below:

1. 2 spec., NMB locality 15814: Río Gurabo; early Pliocene part of Gurabo Formation.
2. 6 spec., NMB locality 15842: Río Gurabo; late Miocene part of Gurabo Formation.
3. 2 spec., NMB locality 15844: Río Gurabo; late Miocene part of Gurabo Formation.
4. 3 spec., NMB locality 15863: Río Gurabo; lower part of Gurabo Formation (late Miocene).
5. 2 spec., NMB locality 15865: Río Gurabo; lower part of Gurabo Formation (late Miocene).
6. 1 spec., NMB locality 15866: Río Gurabo; lower part of Gurabo Formation (late Miocene).
7. 2 spec., NMB locality 15867: Río Gurabo; lower part of Gurabo Formation (late Miocene).
8. 5 spec., NMB locality 15871: Río Gurabo; lower part of Gurabo Formation (late Miocene).
9. 7 spec., NMB locality 15898: Río Gurabo; Cercado Formation (late Miocene).
10. 5 spec., NMB locality 15899: Río Gurabo; Cercado Formation (late Miocene).
11. 1 spec., NMB locality 15902: Río Gurabo; Cercado Formation (late Miocene).
12. 1 spec., NMB locality 15903: Río Gurabo; Cercado Formation (late Miocene).
13. 1 spec., NMB locality 15905: Río Gurabo; Cercado Formation (late Miocene).
14. 5 spec., NMB locality 15906: Río Gurabo; Cercado Formation (late Miocene).
15. 2 spec., NMB locality 15907: Río Gurabo; Cercado Formation (late Miocene).
16. 1 spec., NMB locality 16808: Río Gurabo; lower part of Gurabo Formation (late Miocene).
17. 1 spec., TU locality 1375: Río Gurabo; Cercado Formation (late Miocene).
18. 2 spec., NMB locality 16807: Río Amina; beds of probably late Miocene age.
19. 2 spec., NMB locality 16821: Río Cana; lowest part of Gurabo Formation (late Miocene).
20. 1 spec., NMB locality 16838: Río Cana; Cercado Formation (late Miocene).
21. 2 spec., NMB locality 16857: Río Cana; Cercado Formation (late Miocene).
22. 74 spec., NMB locality 16910: Río Mao; beds of late Miocene age.
23. 1 spec., NMB locality 17267: La Barranca on Río Yaque del Norte; beds of early Pliocene age (*Globorotalia margaritae* zone).



Text-figure 20.—(Restored) height/width diagram of *Metulella venusta* (G. B. Sowerby II, 1850).

23. 1 spec., NMB locality 17267: La Barranca on Río Yaque del Norte; beds of early Pliocene age (*Globorotalia margaritae* zone).

Measurements.—Plotted in Text-figure 20.

Occurrence.—Río Gurabo section: Cercado Formation (late Miocene): NMB localities 15898, 15899, 15902, 15903, 15905, 15906, 15907, and TU locality 1375. Late Miocene part of Gurabo Formation: NMB localities 15842, 15844, 15863, 15865, 15866, 15867, 15871, 16808. Early Pliocene part of Gurabo Formation (*Globorotalia margaritae* zone): NMB locality 15814.

Río Amina section: beds of probably late Miocene age: NMB locality 16807.

Río Cana section: Cercado Formation (late Miocene): NMB localities 16838, 16857. Late Miocene part of Gurabo Formation: NMB locality 16821.

Río Mao section: beds of late Miocene age: NMB locality 16910.

La Barranca on Río Yaque del Norte: *Globorotalia margaritae* Zone (early Pliocene): NMB locality 17267. For location and stratigraphic position of all these lo-

calities see Saunders *et al.*, (1986, text-figs. 4, 5, 6, 15, 16, 21, 29, 34, 35).

Distribution.—Not known from outside the Dominican Republic.

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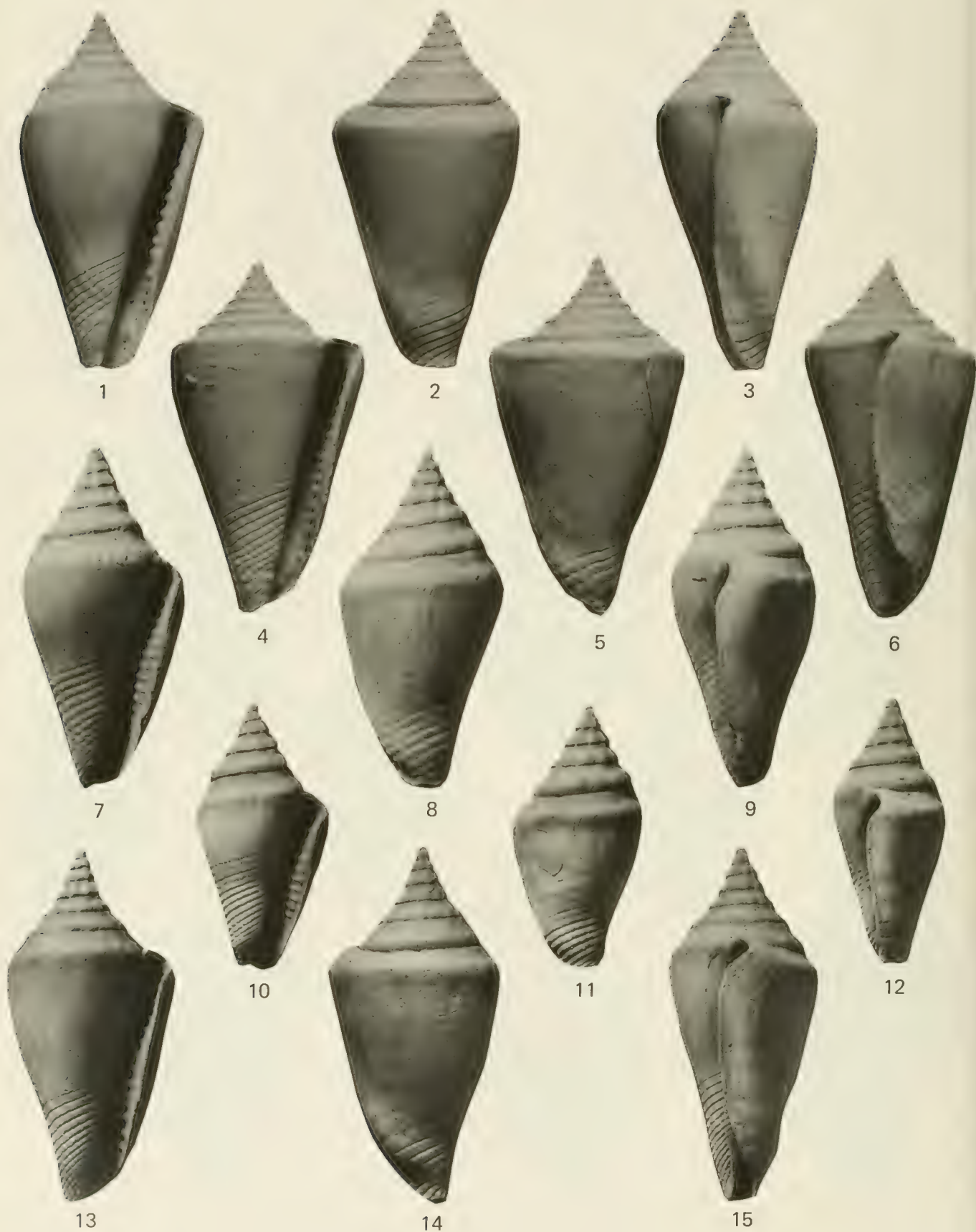
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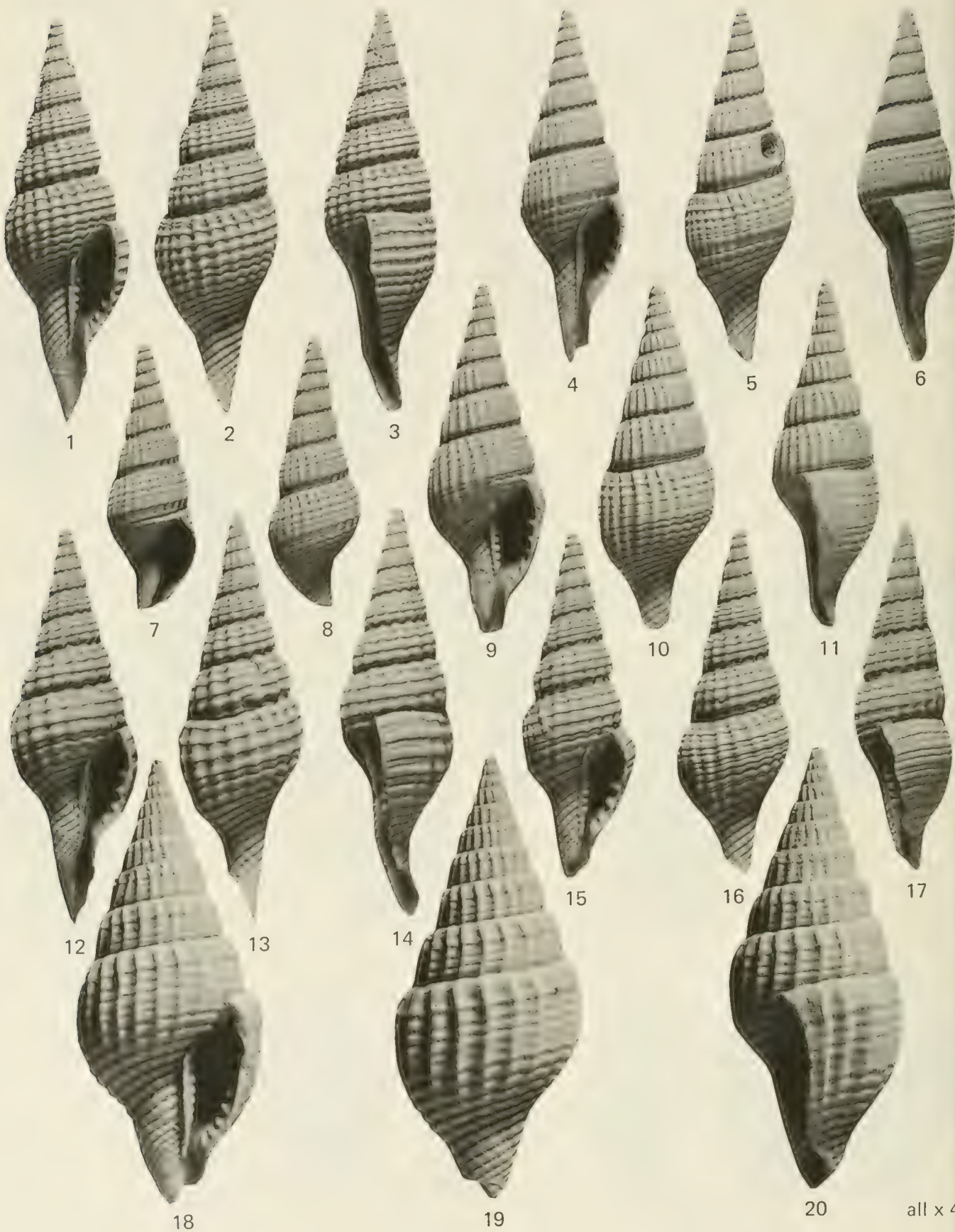
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